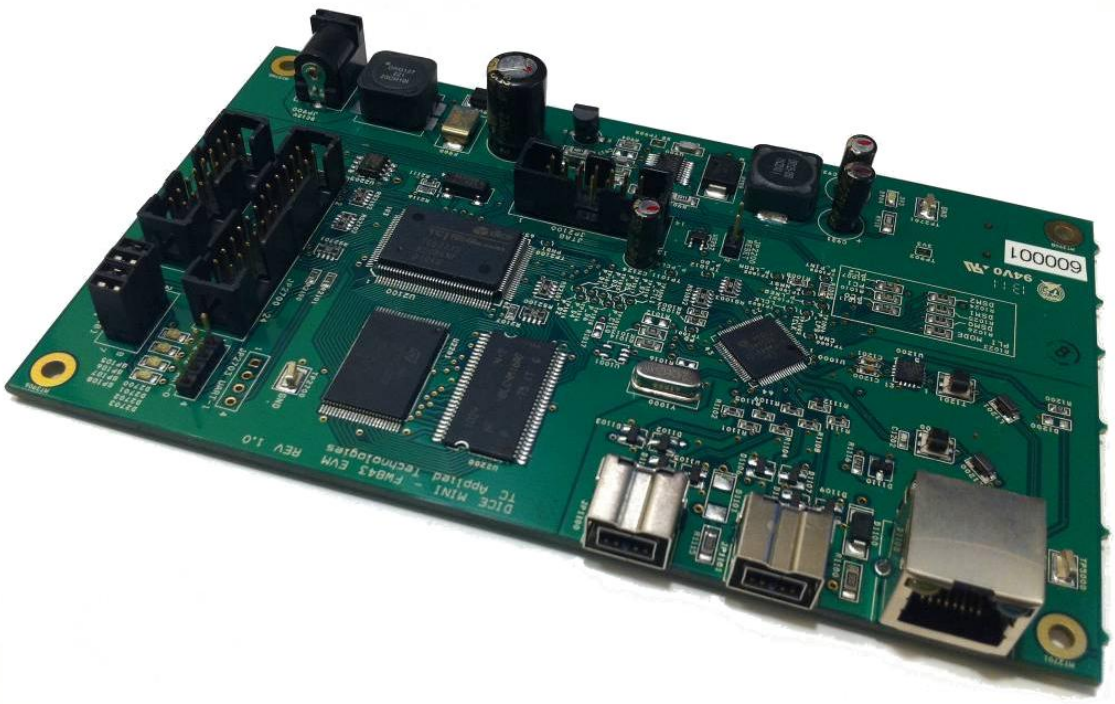
EVM004 – FW843
Rev 1.0 Users Guide



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Revision history

When	Who	What
2011-06-16	BRIANK	Document started, rev 0.1
2011-06-22	BRIANK	Various edits, rev 0.2
2011-06-22	BRIANK	Various edits, rev 0.3
2011-06-23	BRIANK	Various edits based on feedback, rev 0.4
2011-06-28	BRIANK	Various edits, rev 0.9

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1 Overview

The EVM004-FW843 Evaluation Board (EVM004) allows developers to evaluate the DICE chip with 1394B bus topologies. It includes an LSI FW843 IEEE1394B PHY chip, in combination with an EqcoLogic EQCO 400T equalizer chip, allowing extended 1394B bus cable lengths using standard UTP CAT5e and CAT6 network cables. Two 9-pin 1394B connectors are also included to evaluate mixed cable-type buses. The board can be bus-powered on the 9-pin ports, or DC powered.

The EVM is fitted with a DICE Mini (TCD2210) chip, with 4 input and 4 output I2S signals connected to header pins. SPI pins and various GPIO are also routed to header pins, and a number of test points are provided for analyzing relevant PHY and other signals. Status LED's are included for monitoring connection state with the Host and audio signal peaks.

Fully functional firmware is pre-loaded and a firmware source code template is available for this EVM, as well as Host drivers and utilities for all supported Mac OS X and Windows platforms. JTAG debugging is supported using open-source tools and inexpensive JTAG interfaces. The firmware CLI console port is routed to header pins, which can be used with a level-shifter module for RS232 serial terminals, or with a USB-serial converter module (available from TCAT) using virtual COM ports on the Host.

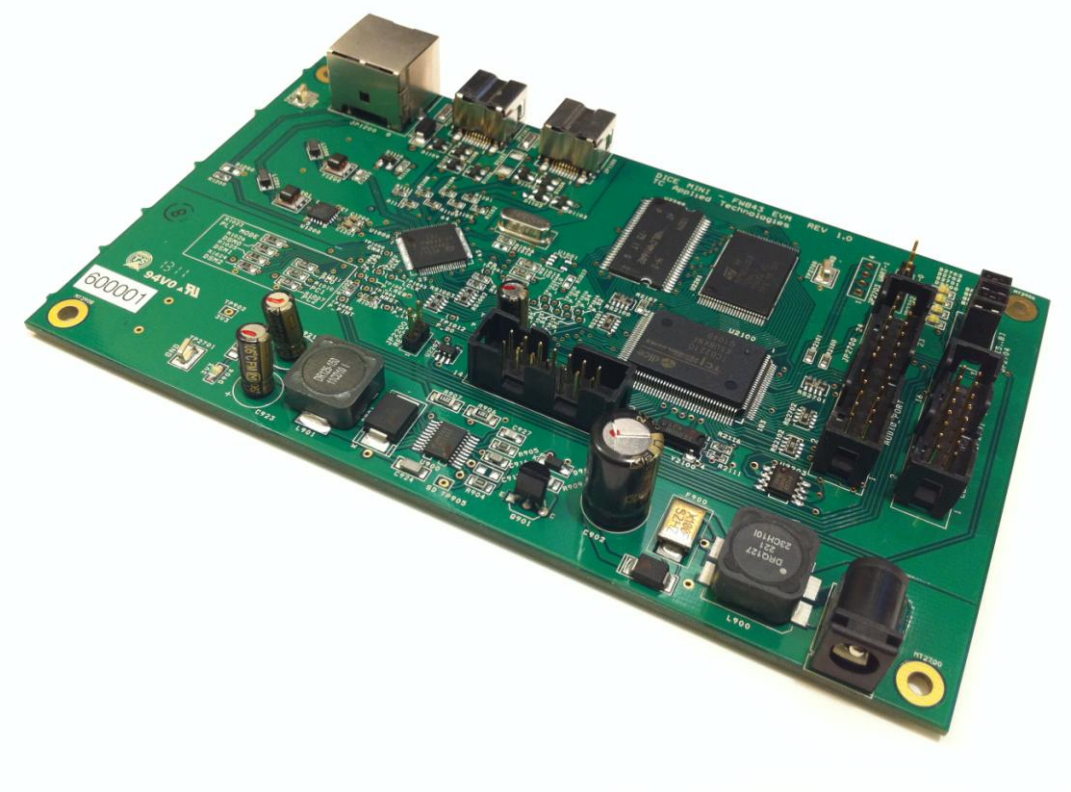

Figure 1 – EVM004 Board

2 Features

- **State of the art DICE Mini (TCD2210)**

  Firmware for DICE-JR (TCD2220) can also be prototyped with the EVM004

  IEEE1394 FireWire interface with hardware streaming engine

  Patented precision JetPLL™ which maximizes the clocking accuracy of audio samples

  Various format digital audio interfaces

  Any-to-any Audio Router

  18x16 on-chip hardware mixer with hardware metering support

  16 KB on-chip SRAM

- **LSI FW843 IEEE1394B Physical layer chip**

  Operated at up to S400 max speed

- (2) 9-pin 1394B connectors
- (1) RJ-45 1394B connector
- **EqcoLogic EQCO 400T Equalizer**

  On the RJ-45 UTP port, the EQCO 400T allows extended Cat5e/Cat6 cable lengths up to 90m at S400 (500 Mb/s)

- 8 MB SDRAM
- 2MB flash storage
- Serial I/O header
- Serial to USB adapter for virtual COM ports on Host computers
- JTAG debugging and programming port
- SPI header pins for peripheral expansion
- 1394 Bus powered, or DC powered

- Fully-functioning firmware example
- Host 1394 Audio Drivers provided, including Customizable Control Panel

  OSX Leopard and Snow Leopard, 32-bit and 64-bit – Core Audio

  Windows XP (x86/x64), Windows Vista (x86), Windows 7 (x86/x64) – ASIO+WDM

  Drivers customized with manufacturer's vendor info are provided at no charge

- Cross-platform Host development and test utilities

3 Block Diagram

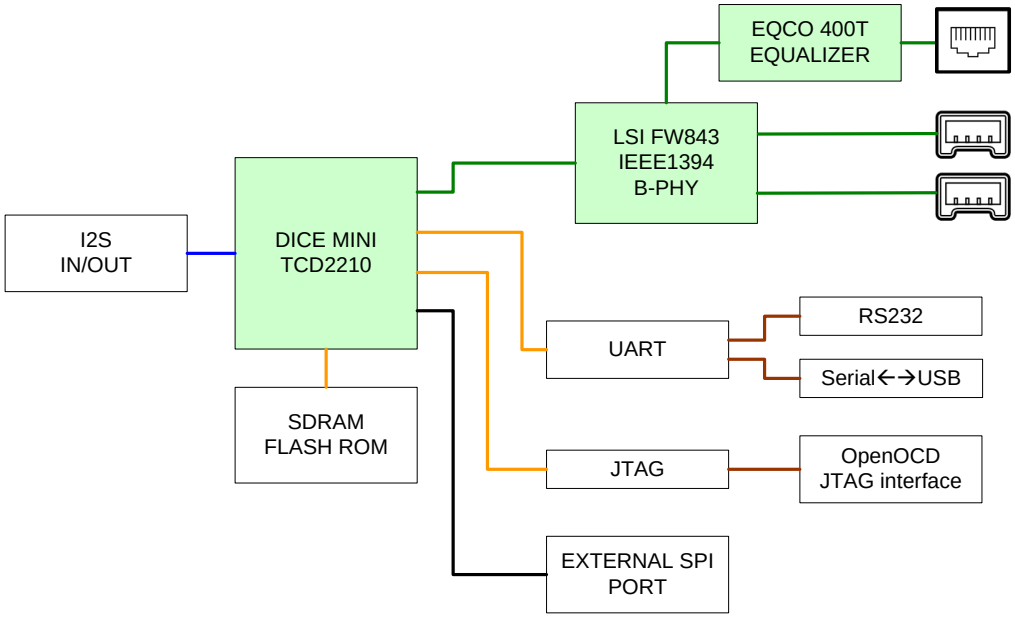

Figure 2 – EVM004 Block Diagram

4 Default Firmware Configuration

On this EVM, 4 input and 4 output audio signal lines, and relevant clock signals, are connected to header pins. While the 4 in and out lines of the DICE Mini can be configured for any combination of ADAT, SPDIF, I2S, I4S and I8S the default firmware template configures all 4 lines for I2S ready to connect to typical AD or DA converters.

The format is configured as default to this (Standard I^2S):

MCLK: 512 x Base Rate => 22MHz – 25MHz

BCLK: 64 x Fs, inverted, drive on neg edge, sample on pos edge

FSYNC: 1 x fs LR Clock, inverted, high during left frame

Dn: 24 bits, MSB first, left justified, 1 bit clock delay

The firmware drives the LED's on the board as described below, and the GPIO lines which drive the LED's can be used for other prototyping purposes by removing the corresponding LED-enable jumpers.

SPI lines are also connected to header pins for prototyping.

The DICE-Mini (TCD2210) is a subset of the DICE-Jr (TCD2220) in terms of audio I/O and similar in most other ways, so the EVM004 can be used to prototype much of the firmware for a DICE-Jr-based product.

5 Components, Connectors and Jumpers

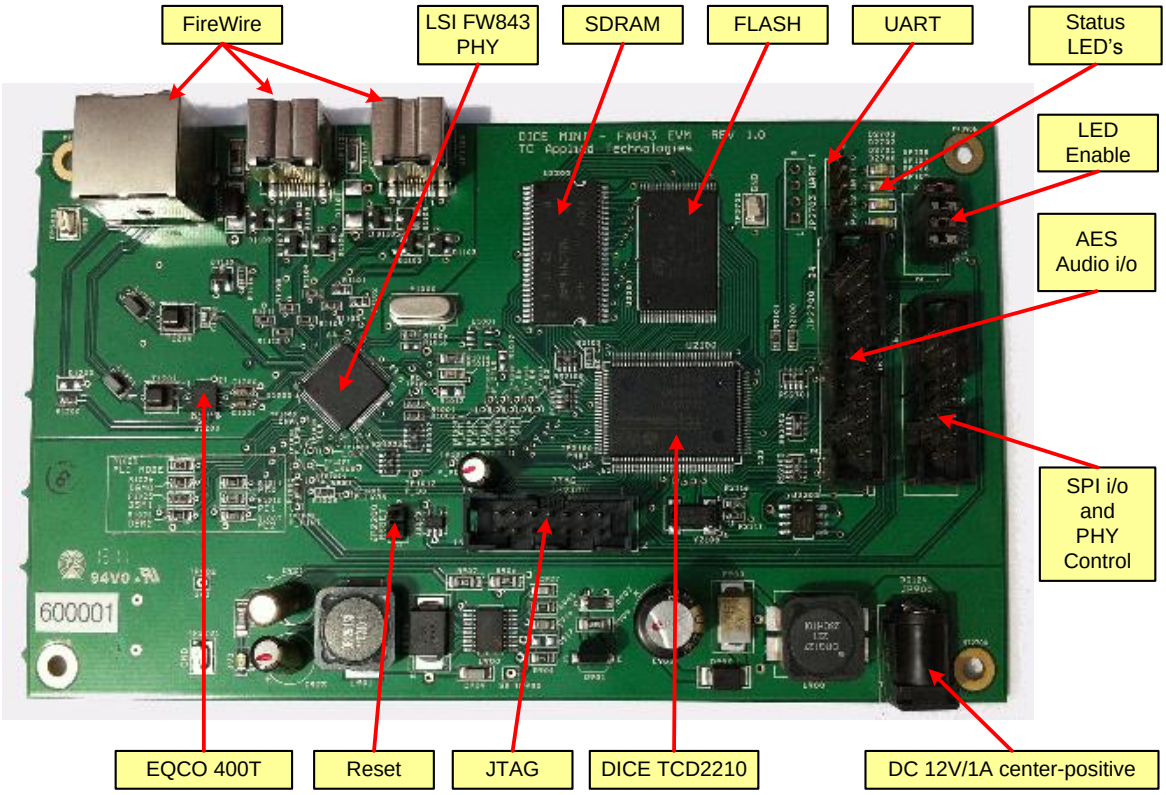

Figure 3 – Components, Connectors and Jumpers

5.1 1394 FireWire

Two 9-pin 1394B connectors JP1100 and JP1101, and one RJ45 1394B connector JP1200, are provided. The 9-pin connectors are isolated for Bus-power. The EVM004 board can be powered by the bus power on either of the 9-pin 1394B ports. Bus power is input only and will not provide to external devices.

When using the RJ45 port, devices are connected with a standard UTP Category 5e or Category 6 *crossover* network cable. When the device is properly connected, the green light on the RJ45 connector will be on continuously. If the green light is not illuminated on both ports, or if it blinks this indicates that the connection is not established, and the cable used is not compliant.

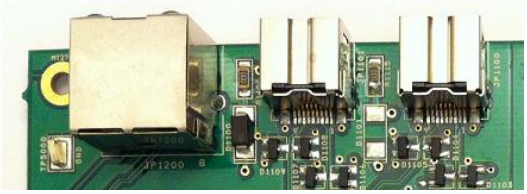

Figure 4 - FireWire Connectors, JP1200, JP1100, JP1101

5.2 DC Power Connector

The EVM004 requires a 12V / 0.3A DC source to DC power receptor JP1902 with center-pin positive. The board can also be powered by 1394 Bus-power.

Pin#	Description
Center	DC 12V
Ring	GND

Table 1 - DC power JP900

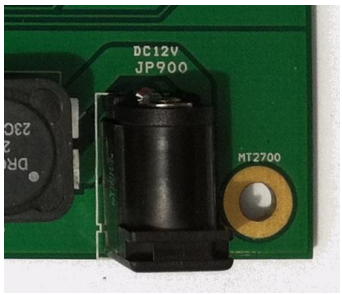

Figure 5 – DC Power, JP900

5.3 Status LED's

LED's D2700, D2701, D2702, D2703, are connected to GPIO5-8 respectively. These can be disabled by removing jumpers on JP2704, in case the developer wishes to use the GPIO lines for other purposes. The LED's are used by the example firmware for the connected and lock status in the Host driver and for audio peak indication.

	LED D2700	LED D2701	LED D2702	LED D2703
GPIO#	5	6	7	8
JP2704 jumper	1-2	3-4	5-6	7-8
Default firmware function	Driver connected	Driver locked	Out L peak (>40dB)	Out R peak (>40dB)

Table 2 – D2700-D2703,
LED GPIO, Functions and Enable Jumpers

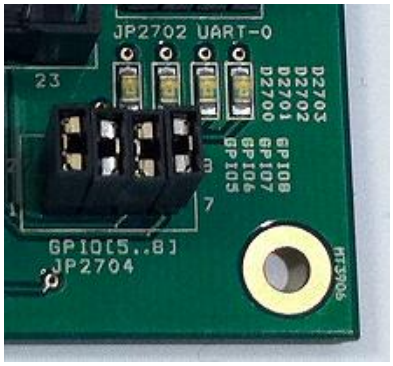

Figure 6 – LED's and jumpers

5.4 Audio Port

The DICE audio output port from DT0 to DT3, input port from DR0 to DR3 and clocks are connected to signal router headers JP2700, along with the bus power signal from the LSI FW843 PHY. Consult the DICE MINI (TCD2210) User Guide and the EVM004 design files for signal descriptions. These i/o signals can be configured for any combination of ADAT, SPDIF, I2S, I4S and I8S.

Figure 7 – Audio Port JP2700

Name	Pin#	Pin#	Name
3.3V	1	2	3.3V
DR0	3	4	DR1
DR2	5	6	DR3
GND	7	8	FCK0
BCK0	9	10	GND
MCK0	11	12	GND
DT0	13	14	DT1
DT2	15	16	DT3
GND	17	18	FCK1
BCK1	19	20	GND
MCK1	21	22	GND
BUS_PWR	23	24	BUS_PWR

Table 3 – Audio Port

5.5 Controls

SPI signals and reset signals are connected to JP2701.

Figure 8 – Controls, JP2701

Name	Pin#	Pin#	Name
3.3V	1	2	3.3V
GND	3	4	SPI_CLK
GND	5	6	MOSI
GND	7	8	MISO
GND	9	10	SPI_NCS
GND	11	12	GPIO5
GPIO4	13	14	GPIO3/PHY_NRST
GND	15	16	NRST

Table 4 – Controls, JP2701

6 Test Points

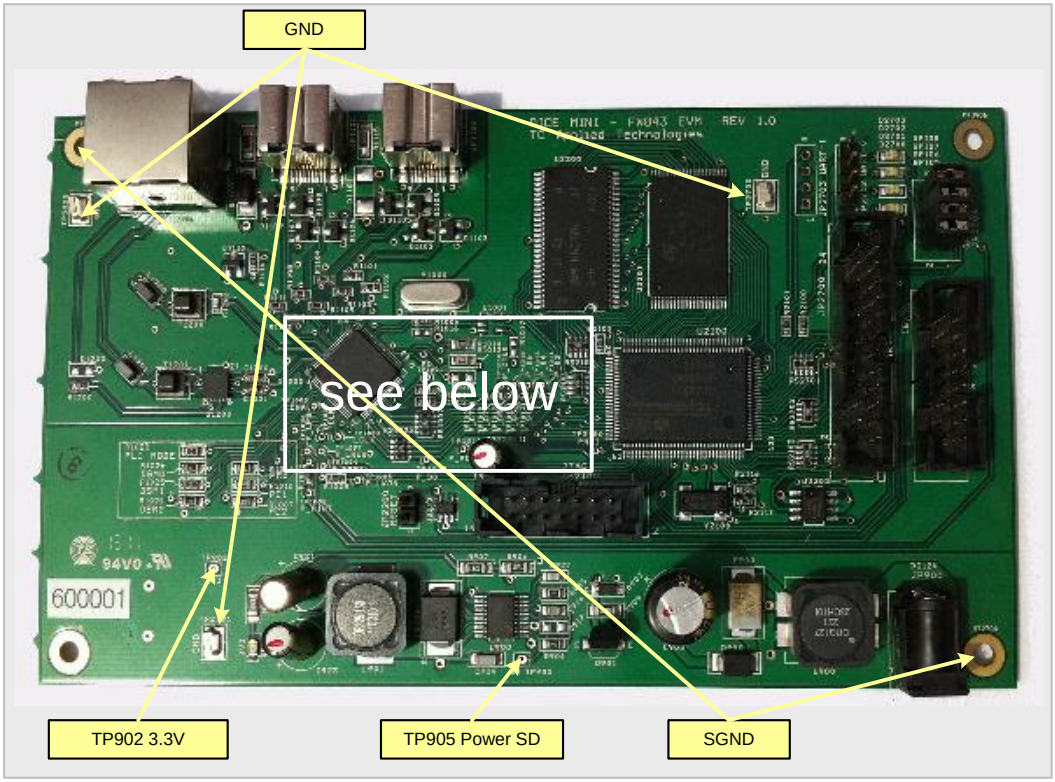

Figure 9 – 3.3V GND, SGND, SD Test points

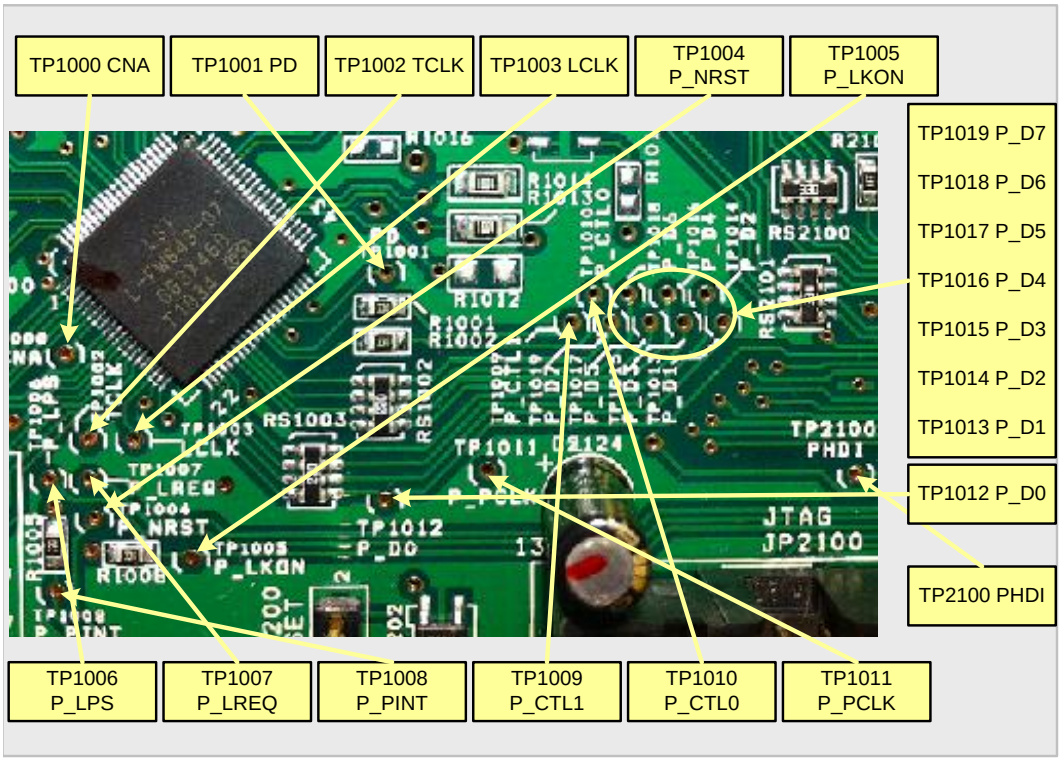

Figure 10 – PHY/Link Test points

7 Debug Ports

7.1 UART

The Firmware Command Line Interface (CLI) uses UART-0 and is connected to JP2702. The DICE debug port UART-1 is connected to JP2703 for serial debugging. JTAG debugging is generally preferred, so the JP2703 header is not placed. UART-1 can also be used for MIDI i/o with a simple firmware change. For serial communication with a Host computer see section 9 below regarding the Serial to USB adapter.

Pin#	Description
1	3.3V
2	DICE TXD
3	GND
4	DICE RXD

Table 5 – UART

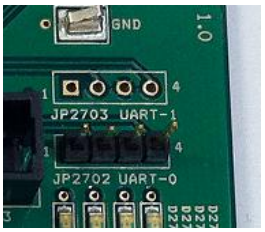

Figure 11 – UART, JP2702, JP2703

7.2 JTAG

The EVM004 board is equipped with a standard 14-pin JTAG connector for debugging and flash ROM initialization. See the OpenOCD resources in the TCAT Subversion repository:

https://dev.tctechnologies.tc/tcat/tags/release/basic/latest/docs/public/firmware/OpenOCD

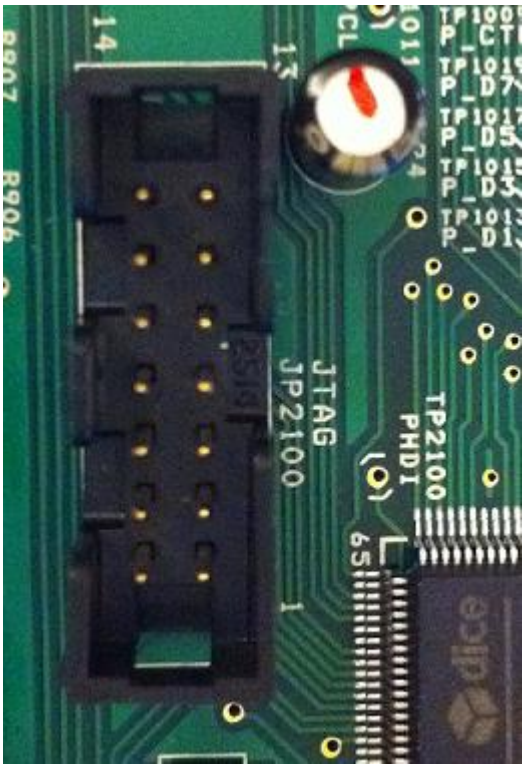

Figure 12 – JTAG

PIN#	SIGNAL	PIN#	SIGNAL
1	3.3V	2	GND
3	NRST	4	GND
5	TDI	6	GND
7	TMS	8	GND
9	TCK	10	GND
11	TDO	12	PULLUP
13	3.3V	14	GND

Table 6 – JTAG Connector, JP2100

8 Master Reset & DC Power Test Point

8.1 Reset

The master board reset can be achieved by shorting pins 1 and 2 of JP2200.

One Rev 1.0 boards, this will not reset the PHY chip. Only a power cycle will reset the PHY chip. See the *Hardware Revisi*ons section below.

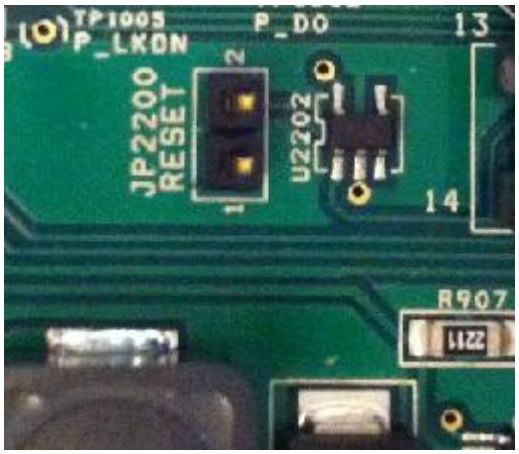

Figure 13 - Reset header, JP2200

8.2 DC 3.3V

Internally generated DC rail 3.3V is connected to test point TP902.

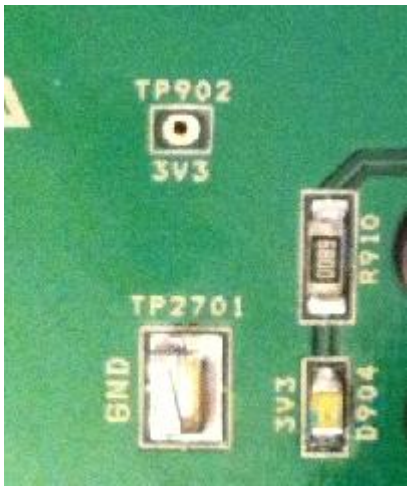

Figure 14 – 3.3V test point, JP902

9 Serial-USB Converter Module

TCAT provides a serial to USB adapter for use with the UART port on the EVM.

Host drivers for this device will be included in the TCAT Firmware Development versions later than rev 4.0.8. Virtual Com Port drivers for all Windows versions are otherwise available here:

http://www.ftdichip.com/Drivers/VCP.htm

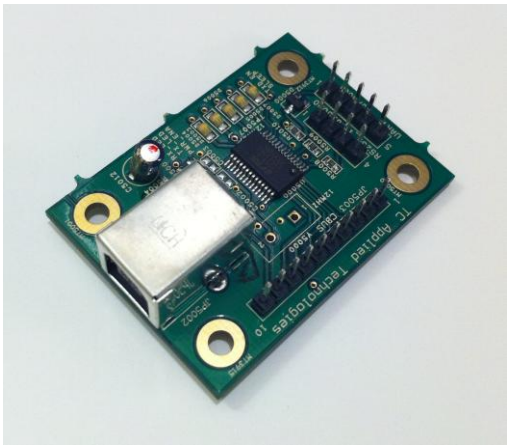

Figure 15 – TCAT Serial/USB adapter

TCAT provides an interface cable for use with the EVM004. The cable pinout is described below in the *Hardware Revisions* section.

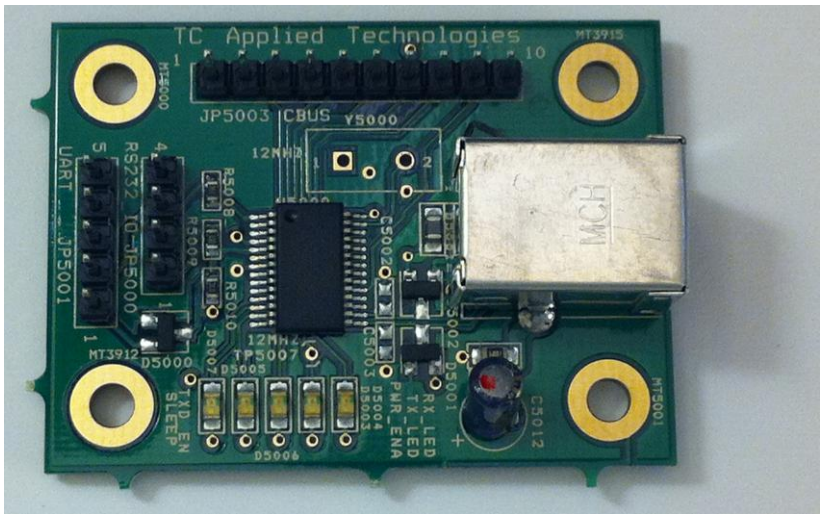

Figure 16 – TCAT Serial/USB adapter

Activity LED's are provided to show serial activity.

This board is not powered via the USB cable, so power is supplied by the EVM. In this case JP5001 on the adapter is used.

Connect the USB adapter to the EVM and power the EVM, then connect the USB cable and open your console program.

Note that since the adapter is not powered by the USB connection, power cycling the EVM will make the USB device disappear and reappear on the Host computer. Please close the terminal program and reopen (or otherwise reconnect the terminal session to the Virtual COM port) after the device is recognized by the computer

10 Hardware Revisions

10.1 Board Revision 1.0

10.1.1 Errata 1

Due to incorrect polarity in the reset signal to the PHY, a rework item is performed on the board. The trace going to pin 2 of the LSY FW843 is cut. The result is that the master Reset jumper JP2200 will not also reset the PHY chip. To reset the PHY, please power cycle the board.

10.1.2 Errata 2

The pinout of the UART port does not match the pinout on the TCAT RS232 level-shifter adapter or the TCAT Serial-USB adapter. The result is that you must use a cable that crosses the tx and rx pins.

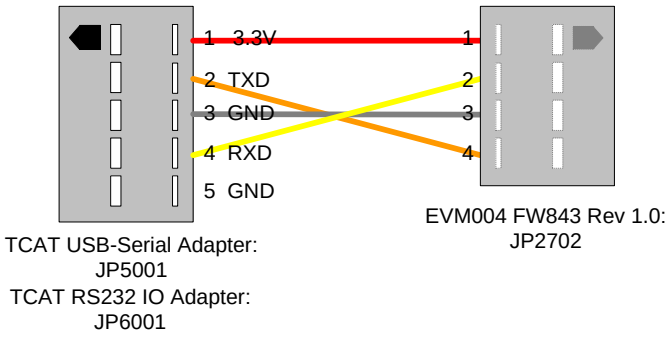

Figure 17 – Serial IO Cable for use with EVM004 – FW843 Evaluation Board

11 Summary

The DICE Mini EVM004-FW843 Evaluation board is part of a complete and easy to use solution for development of advanced, high-performance audio devices, including Firmware, Host computer Drivers, Utilities and User Interfaces.

Contact TC Applied Technologies, Ltd. for development boards, design files, chip User Guides, Firmware development kit, Host development kits and other software.

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