THE DATASHEET OF

TSW14J57EVM

User's Guide
SLWU092A–April 2017–Revised August 2018

TSW14J57 JESD204B High-Speed Data Capture and Pattern Generator Card User's Guide

This user's guide describes the characteristics, operation, and use of the TSW14J57EVM JESD204B high-speed data capture and pattern generator card. Throughout this user's guide, the abbreviations *EVM*, and the term *evaluation module* are synonymous with the TSW14J57EVM, unless otherwise noted.

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1 Introduction

The TI TSW14J57 evaluation module (EVM) is a next generation pattern generator and data capture card used to evaluate performances of the new TI JESD204B device family of high-speed analog-to-digital converters (ADC) and digital-to-analog converters (DAC). For an ADC, by capturing the sampled data over a JESD204B interface when using a high-quality, low-jitter clock, and a high-quality input frequency, the TSW14J57 can be used to demonstrate datasheet performance specifications. Using Intel® PSG JESD204B IP cores, the TSW14J57 can be dynamically configurable to support lane speeds from 2 Gbps to 15 Gbps, from 1 to 16 lanes with one firmware build. Together with the accompanying High-Speed Data Converter Pro Graphic User Interface (GUI), it is a complete system that captures and evaluates data samples from ADC EVMs and generates and sends desired test patterns to DAC EVMs.

2 Functionality

The TSW14J57EVM has a single industry standard FMC+ connector that interfaces directly with TI JESD204B ADC and DAC EVMs. The FMC+ carrier connector is compatible with the FMC mezzanine connector. When used with an ADC EVM, high-speed serial data is captured, de-serialized and formatted by an Intel® Arria® 10 FPGA. The data is then stored into an external DDR4 memory bank, enabling the TSW14J57 to store up to 1G 16-bit data samples. To acquire data on a host PC, the FPGA reads the data from memory and transmits it on a high speed 16 bit parallel interface. An onboard high-speed USB 3.0 to parallel converter bridges the FPGA interface to the host PC and GUI.

In pattern generator mode, the TSW14J57 generates desired test patterns for DAC EVMs under test. These patterns are sent from the host PC over the USB interface to the TSW14J57. The FPGA stores the data received into the board DDR4 memory module. The data from memory is then read by the FPGA and transmitted to a DAC EVM across the JESD204B interface connector. The board contains a 100-MHz oscillator used to generate the DDR4 reference clock and a option for a 10-MHz oscillator for general-purpose use. Figure 1 shows the TI TSW14J57 evaluation module.

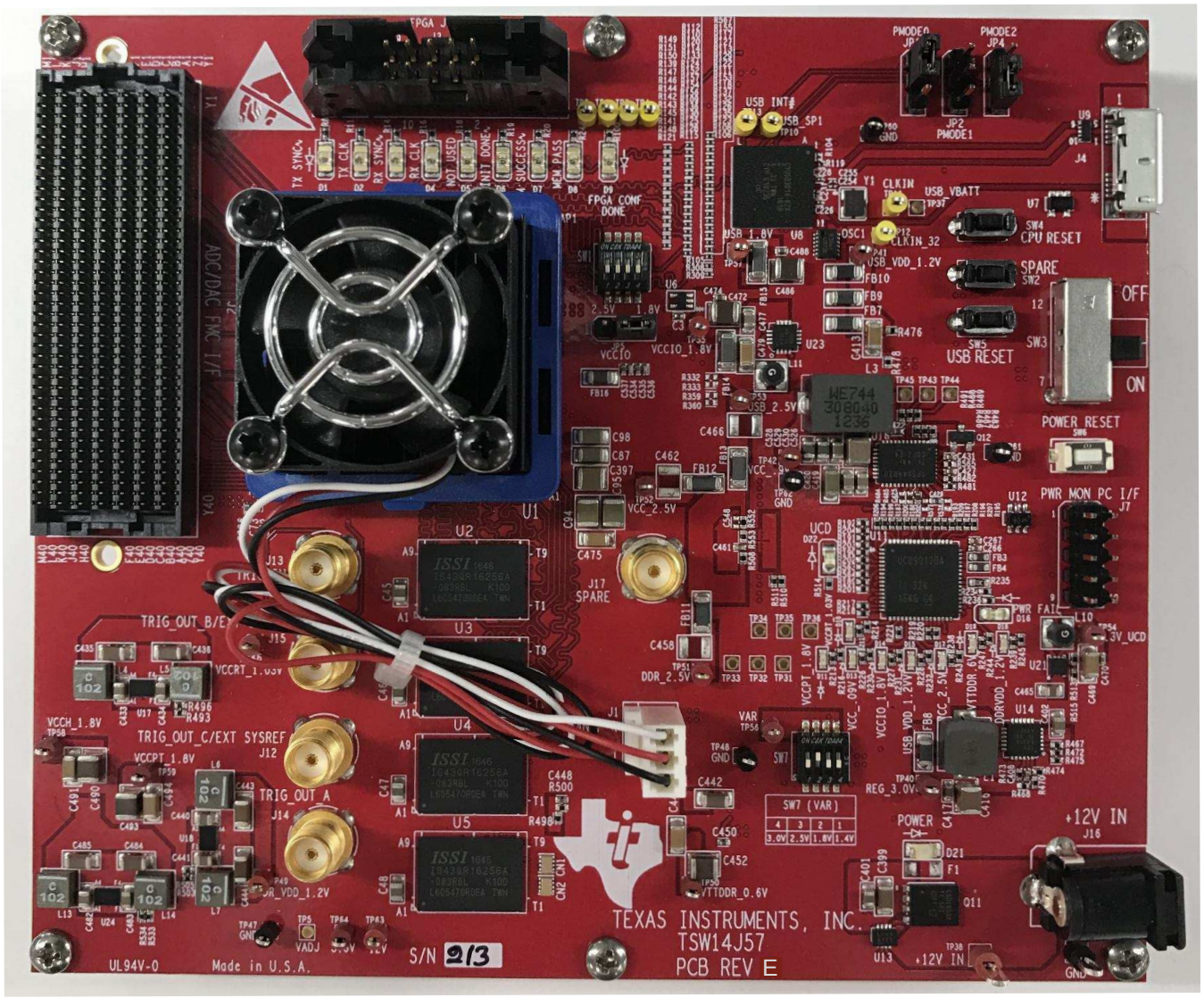

Figure 1. TSW14J57EVM

The major features of the TSW14J57 are:

- Subclasses: 0 (backward compatible), 1, 2
- Support for deterministic latency
- Serial lanes speeds up to 15 Gbps
- 16 routed transceiver channels
- 16Gb DDR4 SDRAM (split into four independent 256×16, 4Gb SDRAMs). Quarter rate DDR4 controllers supporting up to 1200-MHz operation
- 1G of 16-bit samples of onboard memory
- Supports 1.8- and 2.5-V CMOS IO standard
- General purpose 100-MHz oscillator
- Onboard UCD90120A for power sequencing and monitoring
- Onboard Cypress CYUSB301X USB 3.0 device for JTAG and parallel interface to the FPGA
- Reference clocking for transceivers available through FMC+ port or SMAs
- Supported by TI HSDC PRO software

- FPGA firmware developed with Quartus® Prime 16.1 and QSYS
  - JESD RX IP core with support for:
    - USB and JTAG reconfigurable JESD core parameters: L, M, K, F, HD, S, and more
    - ILA configuration data accessible through USB and JTAG
    - Lane alignment and character replacement enabled or disabled through USB and JTAG
  - JESD TX IP core with support for:
    - USB and JTAG reconfigurable JESD core parameters: L, M, K, F, HD, S, and more
    - ILA data configured through USB and JTAG
    - Character replacement enabled or disabled through USB and JTAG
  - Dynamically reconfigurable transceiver data rate. Operating range from 2 to 15 Gbps

Figure 2 shows a block diagram of the TSW14J57 EVM.

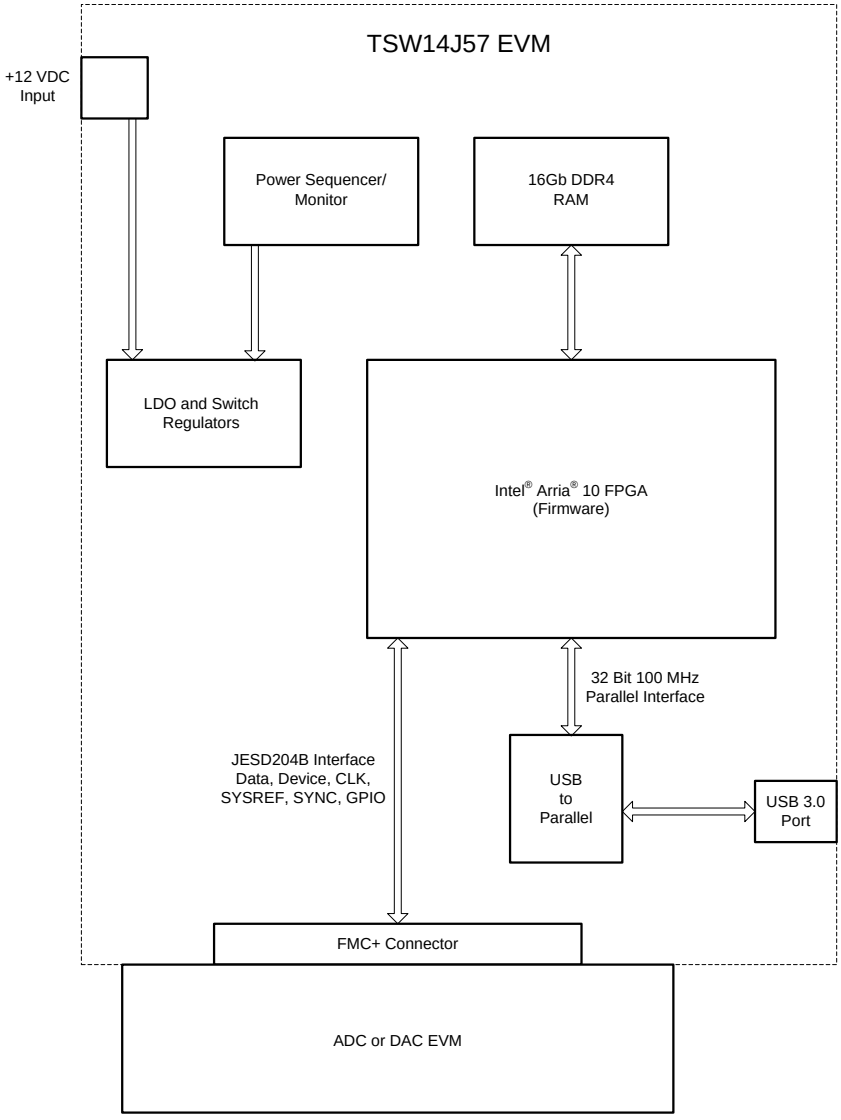

Figure 2. TSW14J57 EVM Block Diagram

2.1 ADC EVM Data Capture

New TI high-speed ADCs and DACs now have high-speed serial data that meets the JESD204B standard. These devices are generally available on an EVM that connects directly to the TSW14J57EVM. The common connector between the EVMs and the TSW14J57EVM is a Samtec high-speed, high-density FMC+ connector (ASP-184329-01) suitable for high-speed differential pairs up to 28 Gbps. A common pinout for the connector across a family of EVMs has been established. At present, the interface between the EVMs and the TSW14J57EVM has defined connections for 29 spare differential LVDS or 58 single-ended CMOS signals, 16 lanes of serial differential data, two device clock pairs, two JESD204B SYSREF and SYNC pairs. The board has a spare SMA interface to the FPGA, 4 spare dip switches, a pushbutton switch, several spare test points routed to the FPGA and 8 status LEDs.

The data format for JESD204B ADCs and DACs is a serialized format, where individual bits of the data are presented on the serial pairs commonly referred to as lanes. Devices designed around the JESD204B spec can have up to 8 lanes for transmitting or receiving data. The firmware in the FPGA on the TSW14J57 is designed to accommodate any of TI's ADC or DAC operating with any number of lanes from 1 to 16.

The GUI loads the FPGA with the appropriate firmware and a specific JESD204B configuration, based on the ADC device selected in the device drop down window. Each ADC device that appears in this window has an initialization file (.ini) associated to it. This .ini file contains JESD information, such as number of lanes, number of converters, octets per frame, and other parameters. This information is loaded into the FPGA registers after the user clicks on the capture button. After the parameters are loaded, synchronization is established between the data converter and FPGA and valid data is then captured into the on-board memory. See the *High-Speed Data Capture Pro GUI Software User's Guide* (SLWU087) under the Technical Documents section and section 2.3 in the guide for more information. Several .ini files are available to allow the user to load pre-determined ADC JESD204B interfaces. For example, if the user selects the ADC called "ADS42JB69_LMF_421", the FPGA will be configured to capture data from the ADS42JB69EVM with the ADC JESD interface configured for 4 lanes, 2 converters, and 1 octet per frame.

The TSW14J57 device can capture up to 1G 16-bit samples at a maximum line rate of 15 Gbps that are stored inside the on-board DDR4 memory. To acquire data on a host PC, the FPGA reads the data from memory and transmits parallel data to the on-board high-speed parallel-to-USB converter.

2.2 DAC EVM Pattern Generator

In pattern generator mode, the TSW14J57EVM generates desired test patterns for DAC EVMs under test. These patterns are sent from the host PC over the USB interface to the TSW14J57. The FPGA stores the data received into the on-board DDR4 memory. The data from the memory is then read by the FPGA, converted to JESD204B serial format, then transmitted to a DAC EVM. The TSW14J57 can generate patterns up to 1G 16-bit samples at a line rate up to 15 Gbps.

The GUI comes with several existing test patterns that can be download immediately. The GUI also has a pattern generation tool that allows the user to generate a custom pattern, then download it to the on-board memory. See the *High-Speed Data Capture Pro Software User's Guide* (SLWU087) for more information. Like the ADC capture mode, the DAC pattern generator mode uses .ini files to load predetermined JESD204B interface information to the FPGA.

3 Hardware Configuration

This section describes the various portions of the TSW14J57EVM hardware.

3.1 Power Connections

The TSW14J57EVM hardware is designed to operate from a single supply voltage of +12 V DC. The power input is controlled by the on and off switch, SW3. Make sure this switch is in the off position before inserting the provided power cable. Insert the connector end of the power cable into J16 of the EVM. Connect the positive red wire end of the power cable to +12 V DC output of a power supply rated for at least 2 Amps. Connect the negative black wire to the RETURN or GND of the power supply. The board can also be powered up by providing +12 V DC to the red test point, TP38, and the return to any black GND test point. As an example, the TSW14J57 draws approximately 0.6 A at power-up and 1.4 A when capturing 4 lanes of data from an ADC34J45 at a line rate of 3.2 Gpbs.

NOTE: The typical power supply range for the TSW14J57EVM is between 10V to 14V with a power consumption of about 14.5W. It is recommended that at least a 2 A rated supply be provided to the TSW14J57EVM due to the current consumption increase when data is being captured by HSDC Pro.

3.2 Switches, Jumpers, and LEDs

3.2.1 Switches and Pushbuttons

The TSW14J57 contains several switches and pushbuttons that enable certain functions on the board. The description of the switches can be found in Table 1.

Table 1. Switch Description of the TSW14J57 Device

Component	Description
SW1	Spare dip switches that are connected to spare FPGA inputs
SW2	Spare pushbutton that are connected to spare FPGA inputs
SW3	Board main power switch
SW4 (CPU RESET)	FPGA hardware reset
SW5	Power monitor U13 reset
SW6 (UCD Reset)	Power monitor U13 reset
SW7	Dip switch to set VAR adjustable step-down output voltage. Default is 1.8V (switches 1,3,4 off, 2 on)

3.2.2 Jumpers

The TSW14J57 contains several jumpers (JP) and solder jumpers (SJP) that enable certain functions on the board. The description of the jumpers can be found in Table 2.

Table 2. Jumper Description of the TSW14J57 Device

Component	Description	Default
SJP1 - SJP3	Sets programming mode for FPGA	2 to 3
SJP4	Power enable to general-purpose, 100-MHz OSC Y3	1 to 2
JP1	Programming mode for USB controller U8A	1 to 2
JP2	Programming mode for USB controller U8A	Open
JP4	Programming mode for USB controller U8A	2 to 3
JP5	Sets VCCIO for Arria® 10	2 to 3

3.3 LEDs

3.3.1 Power and Configuration LEDs

Several LEDs are on the TSW14J57 EVM to indicate the presence of power and the state of the FPGA. The description of these LEDs can be found in Table 3.

Table 3. Power and Configuration LED Description of the TSW14J57 Device

Component	Description
D9	On after FPGA completes configuration
D10	On if VCCRT_1.03V_STAT are within specification
D11	On if VCCpT_1.8V_STAT are within specification
D13	On if VCC_0.95V_STAT are within specification
D14	On if VCCIO_1.8V_STAT are within specification
D15	On if USB_VDD_1.2V_STAT are within specification
D16	On if power monitor device indicates that a power net is out of tolerance
D17	On if VCC_2.5V_STAT are within specification
D18	On if VTTDDR_0.6V_STAT are within specification
D19	On if DDR_VDD_1.2V_STAT are within specification
D21	On if 12V board power is present
D22	On if 3.3V is being provided for the power supply sequencer

3.3.2 Status LEDs

Eight status LEDs on the TSW14J57EVM indicate the status of the FPGA, DDR4, and JESD204B interface:

D1 – Indicates DAC EVM established SYNC with the TSW14J57 device when off

D2 – Indicates presence of device clock from DAC EVM when blinking

D3 – Indicates ADC EVM established SYNC with the TSW14J57 device when off

D4 – Indicates presence of device clock from ADC EVM when blinking

D5 – Not used

D6 – DDR4 initialization and calibration complete when off

D7 – DDR4 ready when off

D8 – DDR4 pass calibration and initialization if on

3.3.3 Connectors

3.3.3.1 SMA Connectors

The TSW14J57 has 5 SMA connectors. The connectors are defined below:

J13	TRIG_IN	Adjustable level CMOS trigger input. Default level is 1.8 V
J14	TRIG_OUT_A	Adjustable level CMOS trigger output. Default level is 1.8 V
J15	TRIG_OUT_B/EXT_GBTCLK	Adjustable level CMOS trigger output. Default level is 1.8 V
J12	TRIG_OUT_C/EXT_SYSREF	Adjustable level CMOS trigger output. Default level is 1.8 V
J17	Spare	Spare

NOTE: TRIG_OUT_A, TRIG_OUT_B, TRIG_OUT_C SMAs are used to provide a SYNC signal. The cables of each trigger signal should have equal length to ensure the trigger signal arrives at the same time for all boards. TRIG_OUT_B and TRIG_OUT_C are multifunctional SMA connectors. TRIG_OUT_B and TRIG_OUT_C can be used to provide a primary reference clock or SYSREF signal by making adjustments to the 0Ω resistors on the signal path.

3.3.3.2 FPGA Mezzanine Card (FMC+) Connector

The TSW14J57 EVM has one connector to allow for the direct plug in of TI JESD204B serial interface ADC and DAC EVMs. The specifications for this connector are mostly derived from the ANSI/VITA 57.4 FPGA Mezzanine Card (FMC+) Standard. This standard describes the compliance requirements for a low-overhead protocol bridge between the IO of a mezzanine card and an FPGA processing device on a carrier card. This specification is being used by FPGA vendors on their development platforms.

The FMC+ connector, J2, provides the interface between the TSW14J57EVM and the ADC or DAC EVM under test. This 560-pin Samtec high-speed, high-density connector (part number ASP-184329-01) is suitable for high-speed differential pairs up to 28 Gbps.

In addition to the JESD204B standard signals, several CMOS single-ended signals and LVDS differential signals are connected between the FMC+ and FPGA. In the future, these signals may allow the HSDC Pro GUI to control the SPI serial programming of ADC and DAC EVMs that support this feature. The connector pinout description is shown in Table 4.

Table 4. FMC+ Connector Description of the TSW14J57

FMC+ Signal Name	FMC+ Pin	Standard JESD204 Application Mapping	Description
RX0_P/N	C6 and C7	Lane 0± (M → C)	JESD Serial data transmitted from mezzanine and received by carrier
RX1_P/N	A2 and A3	Lane 1± (M → C)	JESD Serial data transmitted from mezzanine and received by carrier
RX2_P/N	A6 and A7	Lane 2± (M → C)	JESD Serial data transmitted from mezzanine and received by carrier
RX3_P/N	A10 and A11	Lane 3± (M → C)	JESD Serial data transmitted from mezzanine and received by carrier
RX4_P/N	A14 and A15	Lane 4± (M → C)	JESD Serial data transmitted from mezzanine and received by carrier
RX5_P/N	A18 and A19	Lane 5± (M → C)	JESD Serial data transmitted from mezzanine and received by carrier
RX6_P/N	B16 and B17	Lane 6± (M → C)	JESD Serial data transmitted from mezzanine and received by carrier
RX7_P/N	B12 and B13	Lane 7± (M → C)	JESD Serial data transmitted from mezzanine and received by carrier
RX8_P/N	B8 and B9	Lane 8± (M → C)	JESD Serial data transmitted from mezzanine and received by carrier
RX9_P/N	B4 and B5	Lane 9± (M → C)	JESD Serial data transmitted from mezzanine and received by carrier
RX10_P/N	Y10 and Y11	Lane 10± (M → C)	JESD Serial data transmitted from mezzanine and received by carrier
RX11_P/N	Z12 and Z13	Lane 11± (M → C)	JESD Serial data transmitted from mezzanine and received by carrier
RX12_P/N	Y14 and Y15	Lane 12± (M → C)	JESD Serial data transmitted from mezzanine and received by carrier
RX13_P/N	Z16 and Z17	Lane 13± (M → C)	JESD Serial data transmitted from mezzanine and received by carrier
RX14_P/N	Y18 and Y19	Lane 14± (M → C)	JESD Serial data transmitted from mezzanine and received by carrier
RX15_P/N	Y22 and Y23	Lane 15± (M → C)	JESD Serial data transmitted from mezzanine and received by carrier

Table 4. FMC+ Connector Description of the TSW14J57 (continued)

FMC+ Signal Name	FMC+ Pin	Standard JESD204 Application Mapping	Description
TX0_P/N	C2 and C3	Lane 0± (C → M)	JESD Serial data transmitted from carrier and received by mezzanine
TX1_P/N	A22 and A23	Lane 1± (C → M)	JESD Serial data transmitted from carrier and received by mezzanine
TX2_P/N	A26 and A27	Lane 2± (C → M)	JESD Serial data transmitted from carrier and received by mezzanine
TX3_P/N	A30 and A31	Lane 3± (C → M)	JESD Serial data transmitted from carrier and received by mezzanine
TX4_P/N	A34 and A35	Lane 4± (C → M)	JESD Serial data transmitted from carrier and received by mezzanine
TX5_P/N	A38 and A39	Lane 5± (C → M)	JESD Serial data transmitted from carrier and received by mezzanine
TX6_P/N	B36 and B37	Lane 6± (C → M)	JESD Serial data transmitted from carrier and received by mezzanine
TX7_P/N	B32 and B33	Lane 7± (C → M)	JESD Serial data transmitted from carrier and received by mezzanine
TX8_P/N	B28 and B29	Lane 8± (C → M)	JESD Serial data transmitted from carrier and received by mezzanine
TX9_P/N	B24 and B25	Lane 9± (C → M)	JESD Serial data transmitted from carrier and received by mezzanine
TX10_P/N	Z24 and Z25	Lane 10± (C → M)	JESD Serial data transmitted from carrier and received by mezzanine
TX11_P/N	Y26 and Y27	Lane 11± (C → M)	JESD Serial data transmitted from carrier and received by mezzanine
TX12_P/N	Z28 and Z29	Lane 12± (C → M)	JESD Serial data transmitted from carrier and received by mezzanine
TX13_P/N	Y30 and Y31	Lane 13± (C → M)	JESD Serial data transmitted from carrier and received by mezzanine
TX14_P/N	Z8 and Z9	Lane 14± (C → M)	JESD Serial data transmitted from carrier and received by mezzanine
TX15_P/N	Y6 and Y7	Lane 15± (C → M)	JESD Serial data transmitted from carrier and received by mezzanine
GBTCLK0_M2C_P/N	D4 and D5	DEVCLKA± (M → C)	Primary carrier-bound reference clock required for FPGA giga-bit transceivers. Equivalent to device clock.
GBTCLK1_M2C_P/N	B20 and B21	Alt. DEVCLKA± (M → C)	Alternate Primary Carrier-bound reference clock required for FPGA giga-bit transceivers. For use when DEVCLKA (M → C) is not available
GBTCLK5_M2C_P/N	Z20 and Z21	Alt. DEVCLKA+ (M → C)	Alternate Primary Carrier-bound reference clock required for FPGA giga-bit transceivers. For use when DEVCLKA (M → C) is not available
Device Clock, SYSREF, and SYNC			
CLK_LA0_P/N	G6 and G7	DEVCLKB± (M → C)	Secondary carrier-bound device clock. Used for special FPGA functions such as sampling SYSREF
LA01_P/N_CC	D8 and D9	DEVCLK± (C → M)	Mezzanine-bound device clock. Used for low noise conversion clock
SYSREF_P/N	G9 and G10	SYSREF± (M → C)	Carrier-bound SYSREF signal
LA05_P/N	D11 and D12	SYSREF± (C → M)	Mezzanine-bound SYSREF signal
RX_SYNC_P/N	G12 and G13	SYNC± (C → M)	ADC mezzanine-bound SYNC signal for use in class 0/1/2 JESD204 systems
TX_SYNC_P/N	F10 and F11	DAC SYNC± (M → C)	Carrier-bound SYNC signal for use in class 0/1/2 JESD204 systems
TX_ALT_SYNC_P/N	F19 and F20	Alt. DAC SYNC± (M → C)	Alternate carrier-bound SYNC signal for use in class 0/1/2 JESD204B systems
RX_ALT_SYNC_P/N	H31 and H32	Alt. SYNC± (C → M)	Alternate ADC mezzanine-bound SYNC signal. For use when SYNC (C → M) is not available

Table 4. FMC+ Connector Description of the TSW14J57 (continued)

FMC+ Signal Name	FMC+ Pin	Standard JESD204 Application Mapping	Description
SYNC	K22	DAC SYNC (M → C)	Carrier-bound CMOS-level SYNC signal for use in class 0/1/2 JESD204 systems
Special Purpose I/O			
PG_M2C_A	F1		Power good from mezzanine to carrier
CLK0_M2C_P/N	H4 and H5		GPIO clock
CLK1_M2C_P/N	G2 and G3		GPIO clock

All other signals not mentioned in Table 4 can be used as general purpose I/O, either as single-ended signals or differential pairs. The ANSI/VITA 57.4 standard assigns voltages to certain pins. These are labeled as 12V, 3P3V, and VADJ nets on the connector page of the schematic. On the TSW14J57, these pins are connected to test points to allow the user to provide voltages at these pin locations.

3.3.3.3 JTAG Connectors

The TSW14J57EVM includes three industry-standard JTAG connectors; one that connects to the JTAG ports of the FPGA, one that connects to the JTAG pins of the Cypress FX3 USB Contoller and the other that connects to the programming pins of the power monitor/sequencer device. Jumpers on the TSW14J57EVM allow for the FPGA to be programmed from the JTAG connector or the USB interface. JTAG connectors J3 and J7 are to be used for troubleshooting only. The board default setup is with the FPGA JTAG pins connected to JTAG connector J3. The FPGA can be programmed using this connector if the MSEL inputs are set to the proper logic levels. These are set by solder jumpers SJP1-3. Consult the Intel® PSG data sheet for more information regarding JTAG programming. The FPGA also has the parallel programming inputs connected to the USB 3.0 controller. With SJP1-3 in the default postions, this allows the FPGA to be programmed by the HSDC Pro software GUI. Every time the TSW14J57EVM is powered-down, the FPGA configuration is removed. The user must program the FPGA through the GUI after every time the board is powered-up. This device is programmed at power-up using the factory pre-programmed flash device U10. JTAG connector J7 is used to program the TI UCD90120A power monitor/sequencer device. This device is pre-programmed at the factory and this interface should only be used for troubleshooting.

3.3.3.4 USB I/O Connection

Control of the TSW14J57EVM is through USB 3.0 connector J4. This provides the interface between HSDC Pro GUI running on a PC using the Microsoft® Windows® operating system and the FPGA. For the computer, the drivers needed to access the USB port are included on the HSDC Pro GUI installation software that can be downloaded from the web. The drivers are automatically installed during the installation process. On the TSW14J57EVM, the USB port is used to identify the type and serial number of the EVM under test, load the desired FPGA configuration file, capture data from ADC EVMs, and send test pattern data to the DAC EVMs.

4 Software Start-Up

4.1 Installation Instructions

- Download the latest version of the HSDC Pro GUI to a local location on a host PC. This can be found on the TI website by entering “HIGH SPEED DATA CONVERTER PRO GUI INSTALLER”.
- Unzipping the software package will generate a folder called “High Speed Data Converter Pro - Installer vx.xx.exe", where x.xx is the version number. Run this program to start the installation.
- Make sure to disconnect all USB cables from any TSW14xxx boards before installing the software.
- Follow the on-screen instructions during installation.
- Click on the “Install” button. A new window opens. Click the “Next” button.
- Accept the License Agreement. Click on the “Next” button to start the installation. After the installer has finished, click the “Next” button one last time.
- The installation is now complete. The GUI executable and associated files will reside in the following directory:
  C:\Program Files (x86)\Texas Instruments\High Speed Data Converter Pro.
- Power up the TSW14J57 under test.
- To start the GUI, click on the file called “High Speed Data Converter Pro.exe", located under C:\Program Files\Texas Instruments\High Speed Data Converter Pro.

NOTE: If an older version of the GUI has already been installed, make sure to uninstall it before loading a newer version. If the GUI detects that a newer version of the GUI is available online (http://www.ti.com/tool/DATACONVERTERPRO-SW), it will assist the user with downloading the latest version from the TI website. The GUI automatically interrogates the product website for latest version every seven days but the latest version check can also be manually invoked through use of the pull-down menu Help->Check for updates.

NOTE: When new TI high speed data converter EVMs or JESD204B interface modes become available that are not currently supported by the latest release of HSDC Pro GUI, the HSDCProv_xpxx_Patch_setup executable, available on the TI website under the High Speed Data Converter Pro Software product folder (http://www.ti.com/tool/DATACONVERTERPRO-SW), will allow the user to add these to the GUI device list. After the patch has been downloaded, follow the on-screen instructions to run the patch. The software displays the files that will be added. After running the patch, open HSDC Pro and the new parts and modes will appear in the ADC and DAC device drop-down selection box. The patch is always specific to a core GUI version and will not work for a GUI version for which the patch was not explicitly created.

4.2 USB Interface and Drivers

- Connect a USB 3.0 cable between J4 of the TSW14J57EVM and a host PC.
- Connect the provided power cable between the EVM and a +12 VDC source. LED D21 should turn green now.
- Set SW3 to ON. LEDs D10, D11, D13-D15 and D17-D19 should all turn blue now, as seen in Figure 3.

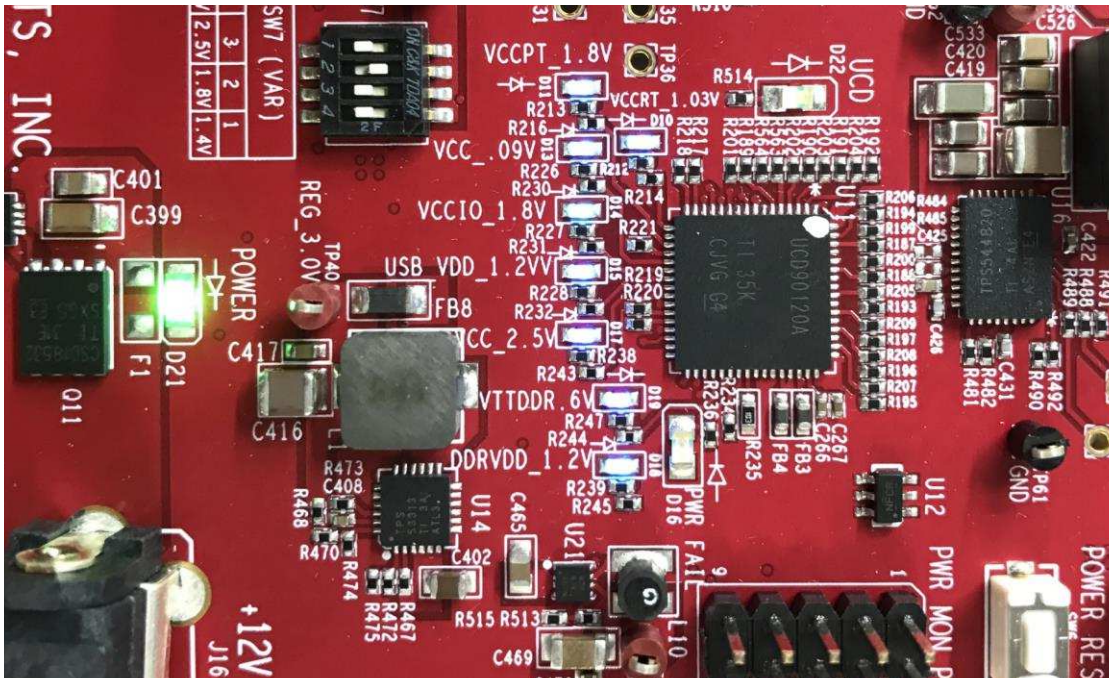

Figure 3. Power Indicator LEDs

Click on the High-Speed Data Converter Pro icon that was created on the desktop panel, or go to C:\Program Files (x86)\Texas Instruments\High Speed Data Converter Pro and double click on the executable called “High Speed Data Converter Pro.exe” to start the GUI.

The GUI first attempts to connect to the EVM USB interface. If the GUI identifies a valid board serial number, a pop-up opens displaying this value, as shown in Figure 4. The user can connect several TSW14J57 EVMs to one host PC, but the GUI can only connect to one at a time. When multiple boards are connected to the PC, the pop-up displays all of the serial numbers found. The user then selects which board to associate the GUI with.

Figure 4. TSW14J57EVM Serial Number

Click “OK” to connect the GUI to the board. The top level GUI opens and appears as shown in Figure 5.

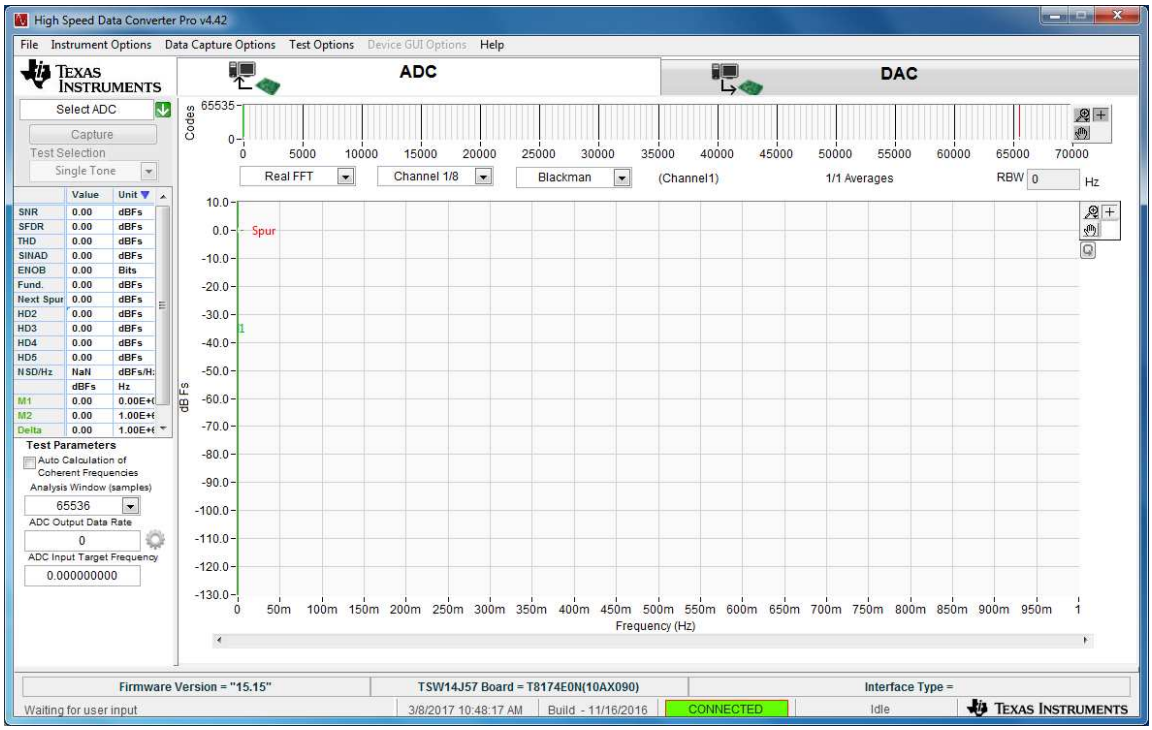

Figure 5. High-Speed Data Converter Pro GUI Top Level

If the message “No Board Connected” opens, double check the USB cable connections and that power switch SW3 is in the on position. Remove the USB cable from the board then re-install. Click on the “Instrument Option” tab at the top left of the GUI and selecting “Connect to the Board”. If this still does not correct this issue, check the status of the host USB port.

When the software is installed and the USB cable is connected to the TSW14J57EVM and the PC, the TSW14J57 USB 3.0 converter should be located in the Hardware Device Manager under the universal serial bus controllers as shown in Figure 6 labeled as Cypress FX3 USB Streamer Example Device. When the USB 3.0 cable is removed, this driver will no longer be visible in the device manager. If the drivers are present in the device manager window and the software still does not connect, remove the USB 3.0 cable from the board then reconnect. Attempt to connect to the board. If the problem still exists, cycle power to the board and repeat the prior steps.

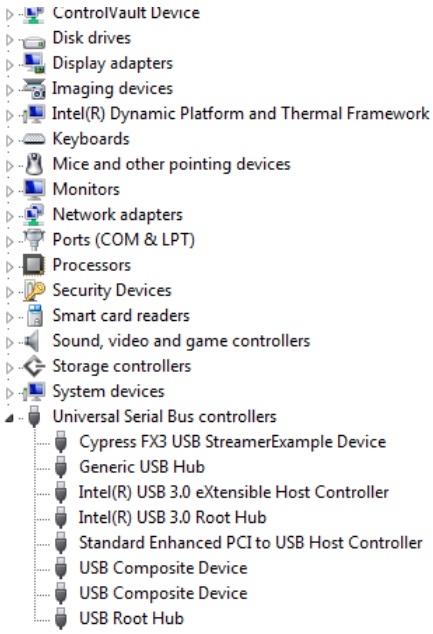

Figure 6. Hardware Device Manager

5 Downloading Firmware

The TSW14J57EVM has an Intel® PSG Arria® 10 device that requires firmware to be downloaded every time power is cycled to operate. The firmware files needed are special .rbf formatted files that are provided with the software package. The files used by the GUI currently reside in the directory called C:\Program Files (x86)\Texas Instruments\High Speed Data Converter Pro\14J57 Details\Firmware.

To load a firmware, after the GUI has established connection, click the “Select ADC” window in the top left of the GUI and select the device to evaluate, for example, ADC34J45_LMF_422, as shown in Figure 7.

The GUI prompts the user to update the firmware for the ADC. Click "Yes”. The GUI will display the message "Downloading Firmware, Please Wait". The software now loads the firmware from the PC to the FPGA, a process that takes about 3 seconds. Once completed, the GUI reports an Interface Type in the lower right corner and LEDs D1, D3, D5-D9 should all turn green, as seen in Figure 8. When data is captured LED D4 will start to blink if an ADC is connected; otherwise, LED D2 will blink if a DAC is connected.

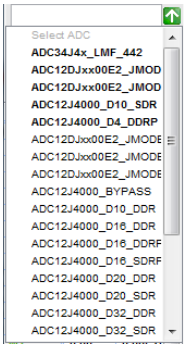

Figure 7. Select ADC Firmware to be Loaded

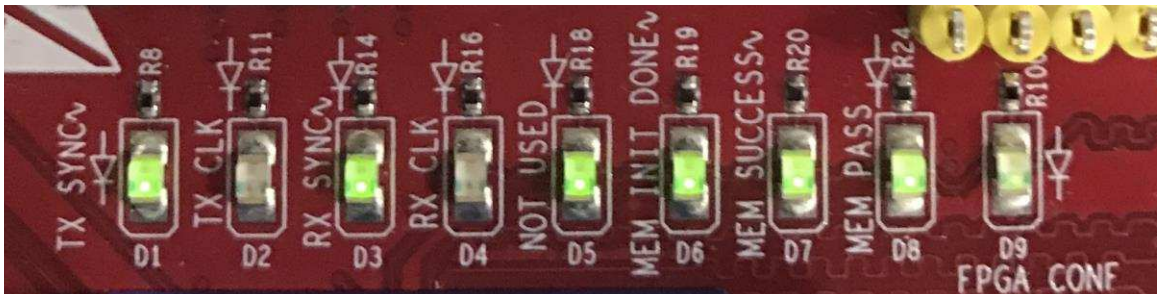

Figure 8. Status LEDs

For information regarding the use of the TSW14J57EVM with a TI ADC or DAC JESD204B serial interface EVM, consult the *High-Speed Data Converter Pro GUI User's Guide* (SLWU087) and the individual EVM User's Guide, available on www.ti.com.

If the message appears as shown in Figure 9, verify that all jumpers are in the default position and all power status LEDs are illuminated. If certain jumpers are not installed in the proper location, the USB 3.0 Controller will not boot from flash memory. If any power status LED is off, there may be a problem with a power supply on the board, which can prevent the firmware from downloading. Unplug and re-install the USB connector and try to connect to the board. If this fails, cycle the power switch to re-initialize the power-up sequencer to try to correct this problem.

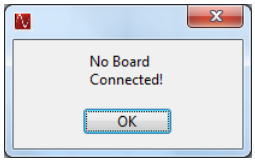

Figure 9. Download Firmware Error Message

Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Original (April 2017) to A Revision **Page**

- Changed Rev C to Rev E in *TSW14J57EVM* figure 3
- Changed description of JP1, JP2, and JP4 in *Jumper Description of the TSW14J57 Device* table 6

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- *Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.*
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