Evaluating the ADIN1140 10BASE-T1S Industrial Multidrop MAC-PHY Feather-Based Demo Board

FEATURES

- Flexible evaluation for ADIN1140 MAC-PHY features with feather form connectivity
- Interface directly with host PC using USB-to-SPI converter

EVALUATION KIT CONTENTS

- DEMO-ADIN114XAZ industrial 10BASE-T1S MAC-PHY evaluation board
- UMFT4222EV-D USB-to-SPI bridge board
- USB type A to micro-USB cable
- Kit does not include MCU feather boards

EQUIPMENT NEEDED

- 6VDC to 30VDC power supply
- PC running Windows® 7 or higher

DOCUMENTS NEEDED

- ADIN1140 data sheet
- ADIN1140 tech ref
- ADIN1140 register control manual

SOFTWARE NEEDED

- ADIN1140 MAC-PHY software driver
- FTDI USB virtual COM port driver (available from FTDI website)
- Any serial COM port terminal software (for example, Tera Term and Termite)

GENERAL DESCRIPTION

The industrial 10BASE-T1S MAC-PHY evaluation board (DEMO-ADIN114XAZ) is a platform that enables the evaluation of Analog Devices' 10BASE-T1S MAC-PHY, which provides half-duplex 10Mbps Single Pair Ethernet (SPE) connectivity to devices compliant with the IEEE 802.3cg 10BASE-T1S Ethernet standard, which supports both multidrop and point-to-point link configurations.

The collateral support for this device includes a C-code software driver with examples that can be used as a starting point when integrating the 10BASE-T1S MAC-PHY in a larger system.

The DEMO-ADIN114XAZ evaluation board includes connectivity for external MCUs in feather board formats, such as the MAX32672FTHR and others, and connectivity to the UMFT4222EV-D USB-to-SPI bridge. The board does not have an on-board MCU, to allow the user maximum flexibility across varies MCU platforms. When using the feather board connectivity, the MAC-PHY software driver must be running on the feather board MCU. When using the UMFT4222EV-D USB-to-SPI bridge, the MAC-PHY software driver may be running on a Windows machine with a USB connection.

Full specifications on the ADIN1140 are available in the ADIN1140 data sheet available from Analog Devices, Inc., and must be consulted with ADIN1140 tech ref, ADIN1140 register control manual, and this user guide when using the DEMO-ADIN114XAZ evaluation board.

EVALUATION BOARD PHOTOGRAPH

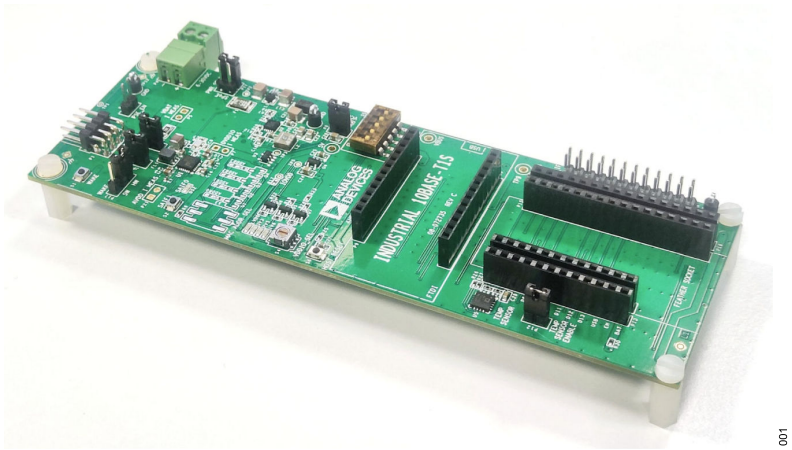

Figure 1. Industrial 10BASE-T1S MAC-PHY Evaluation Board

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REVISION HISTORY

3/2026—Revision 0: Initial Version

EVALUATION BOARD OVERVIEW

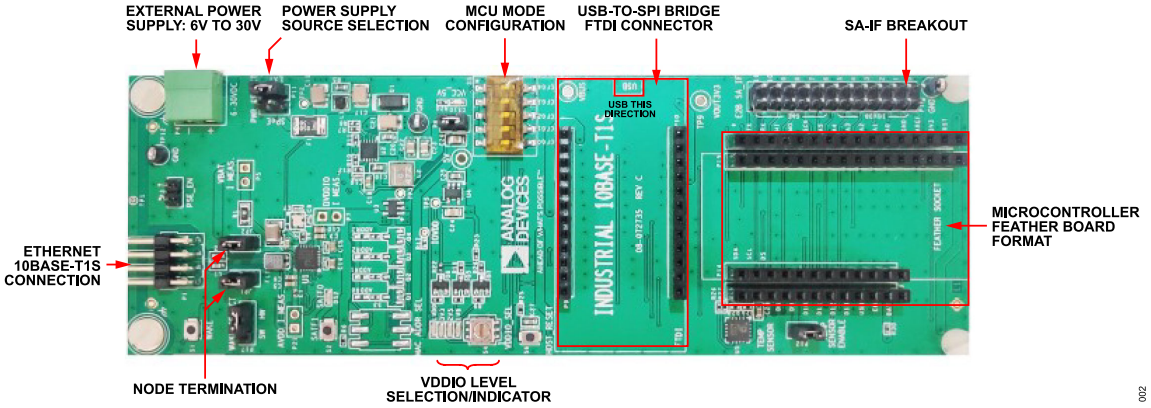

Figure 2. Evaluation Board Hardware Connectivity

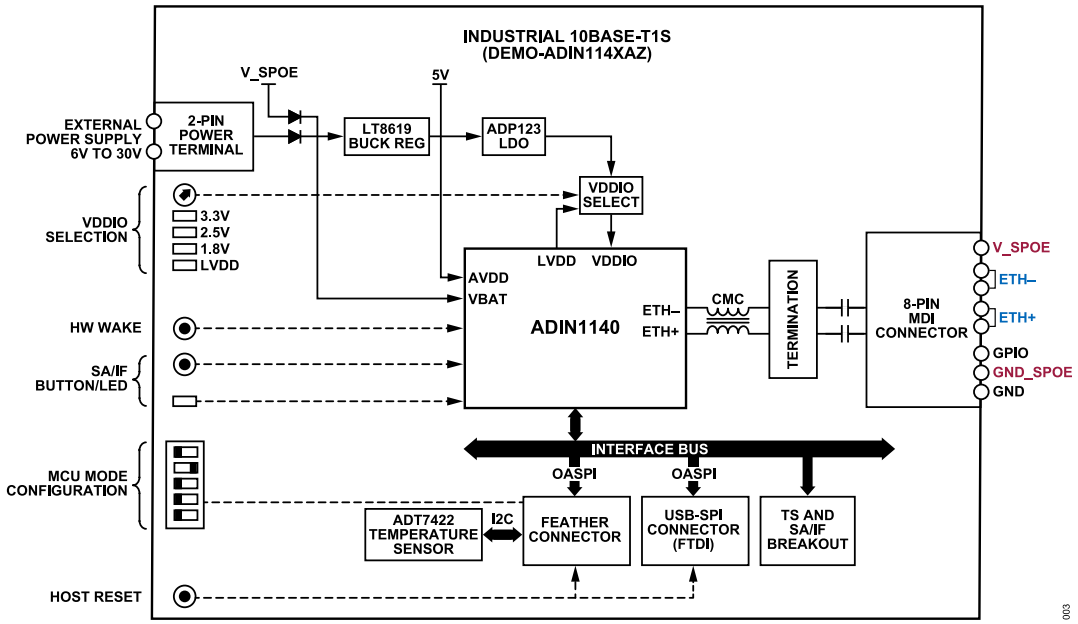

Figure 3. MAC-PHY Evaluation Board Block Diagram

HARDWARE

POWER SUPPLIES

The DEMO-ADIN114XAZ board provides flexible power options for both input and digital supplies.

Input Voltage Supply

The industrial-T1S MAC-PHY evaluation board can be powered using an external 6VDC to 30VDC power supply, the PWR SELECTION header may be used to select the voltage source to power up the board. This can be either from the P4 terminal block or from P1 (V_SPOE Pin 2, GND_SPOE Pin 8).

The board has a polarity protection diode that can be bypassed by setting the PSE_EN jumper. When bypassed the board is capable to inject its local power using the T1S connector P1 (V_SPOE Pin 2).

Digital/Host Supply

VDDIO can be set using the S4 rotary switch (VDDIO_SEL) to values 1.8V, 2.5V, and 3.3V.

By default, the evaluation board supplies 5V to both feather board (VBAT P14-PIN1) and USB-to-SPI FTDI bridge (VCCIN P9-PIN2). It is recommended to check the feather board's configuration before using it on this board. Power supply pin incompatibility may cause damage to both boards. It is possible to disconnect this supply to the feather board and USB-to-SPI connectors by removing the 0Ω resistors R30 and R71, respectively.

HARDWARE CONFIGURATION SETUP

The DEMO-ADIN114XAZ hardware configuration is determined by links (jumpers) and configuration switches on the board. The descriptions and the default hardware configurations of these links and switches are shown in Table 1.

Table 1. Board Jumpers, Connectors, and Switches

Reference	Name	Description
JP1/JP2	Node Termination	Set or remove the 100Ω line termination to the 10BASE-T1S bus. JP1 and JP2 must be set at the controller node and last remote node only. These jumpers must not be set in all other nodes on the same bus.
P11	PWR SELECT	Selects the voltage source for the board, as shown in the Input Voltage Supply section. Default: EXT position.
P3	PSE_EN	Bypasses the input voltage polarity protection diode on the board. Default: Not set.
P8	VCC_5V	Connects the regulated 5V generated on board to the rest of the board circuitry. Default: Set.
P17	WAKE SELECT	Selects the wake-up signal source connected to the WAKE pin on the T1S chip. It can be either a hardware signal using the S1 (WAKE) button, or a software-based signal from connected host: Feather board (P14-PIN5) and USB-to-SPI FTDI bridge (P9-PIN6). Default: HW.
P12	TEMP SENSOR ENABLE	Powers the ADT7422CCPZ on-board temperature sensor. Note: VDDIO must be set to 3.3VDC to use it. Default: Not set.
S1	WAKE	Sends a wake-up signal to the chip.
S4	VDDIO_SEL	Sets the VDDIO voltage on the board to either 1.8V, 2.5V, or 3.3V.
S5	CFG0 to CFG4	General-purpose DIP switch used to set the value of FTHR I/Os (D10, D11, D0, D1, A4) for host hardware configuration (ON position sets the value to 0, and OFF position sets the value to 1).
S6	HOST RESET	Reset push button connected to the host (feather board (P15-PIN1) and USB-to-SPI FTDI bridge (P10-PIN11)).

HARDWARE

10BASE-T1S MDI Connection

ETH− and ETH+ are connected to Pins (3, 4) and Pins (5, 6), respectively, of the P1 connector. The external adapter EV-ADIN114XADPTZ, as shown in Figure 4, is provided for the use of screw-in connectors.

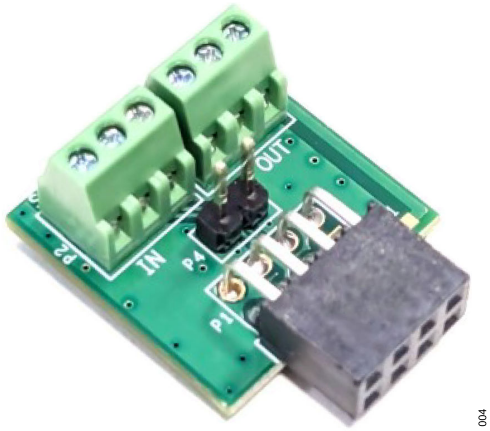

Figure 4. External Adapter for 10BASE-T1S Interface

Host Connection

The board contains at least two options for the host connectivity. Note that only one host can be connected at a time.

FTDI connection: For USB-PC connection using FTDI-FT4222EV board using the connectors P9/P10.

Feather connection: The P14/P15 connectors can be used to connect to some microcontrollers in feather board formats, for example, MAX32672FTHR.

Alternatively, user can use jump wires to connect to other MCU evaluation boards following the pin configuration example for the AD-APARD32690-SL, MAX32690EVKIT, and Nucleo F7 board.

When connecting the host using wires, keep connections short and of equal length.

Table 2. MAXEVAL, RPi, and Nucleo to Evaluation Board Default Connection

MAC-PHY Board Connection	Usage	AD-APARD32690-SL[1]	MAX32690EVKIT[2]	Nucleo F7	Raspberry Pi 4b[3]
P14-PIN4	OASPI - IRQ	P3 – PIN2	JH6 – PIN4	(CN7) PC7	J8 – PIN16
P15-PIN12	OASPI - MOSI	P4 – PIN4	JH5 – PIN4	(CN7) PB5	J8 – PIN19
P15-PIN13	OASPI - MISO	P4 – PIN3	JH5 – PIN3	(CN7) PB4	J8 – PIN21
P15-PIN11	OASPI - CLK	P4 – PIN2	JH5 – PIN5	(CN7) PB3	J8 – PIN23
P14-PIN8	OASPI - CS	P4 – PIN1	JH5 – PIN2	(CN7) PA4	J8 – PIN24
P15-PIN4	GND	P2 – PIN6	JH5 – PIN7	(CN10) PIN 5	J8 – PIN6
P14-PIN5	WAKE PIN	P3 – PIN1	JH6 – PIN2	(CN10) PA0	J8 – PIN11

1 Remove R117 and R121 from AD-APARD32690 when used due to I2C errata.

2 Remove R70-R73 from MAX32690EVKIT when used to isolate the SPI bus from the on-board Audio Codec.

3 For RPi, use the 32-bit version of Legacy (Bullseye) Raspberry Pi OS.

NOTES

ESD Caution
ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.