

EVAL-ADIN1101 Evaluation Board

FEATURES

- ▶ 10BASE-T to 10BASE-T1L media converter
- ▶ Unmanaged, hardware-only configuration with no software
- ▶ Optional engineered power over 10BASE-T1L cable
- ▶ Optional access to MDIO signals for managing PHYs

EVALUATION KIT CONTENTS

- ▶ EVAL-ADIN1101D3Z evaluation board
- ▶ Plugin screw terminal connector
- ▶ Ethernet cable with RJ45 connectors (1m)
- ▶ USB-A to USB-C cable (1m)

EQUIPMENT NEEDED

- ▶ 10BASE-T1L link partner-only device, SPoE device, or APL device
- ▶ 10BASE-T1L compatible, single-pair Ethernet cable (1.5mm² maximum/AWG 16 to fit connector)
- ▶ Host device with standard RJ45 Ethernet port capable of 10BASE-T/10BASE-T full duplex
- ▶ Power supply: 5V_{DC} to 58V_{DC}, 0.6W, or USB-C 5V as power for the board

GENERAL DESCRIPTION

The EVAL-ADIN1101D3Z is a compact media converter board providing connection between a standard 10BASE-T RJ45 Ethernet port and a 10BASE T1L Ethernet port. It operates unmanaged, with Ethernet physical layers (PHYs) configured only by hardware; there is no controller and no software on the board.

There is an option to access the PHYs MDIO signals for monitoring or managing the PHYs from an externally connected controller.

The board can be powered from an external power supply with output voltage between 5V to 58V_{DC} connected via a standard power barrel connector or from a 5V source with a standard USB-C connector.

The EVAL-ADIN1101D3Z includes optional engineered power coupling for the 10BASE-T1L Ethernet port. The board can forward power from an external supply to the 10BASE-T1L port, or alternatively be powered via the 10BASE-T1L port. Only basic overcurrent protection and polarity protection are provided; power polarity correction is not supported.

EVALUATION BOARD PHOTOGRAPH

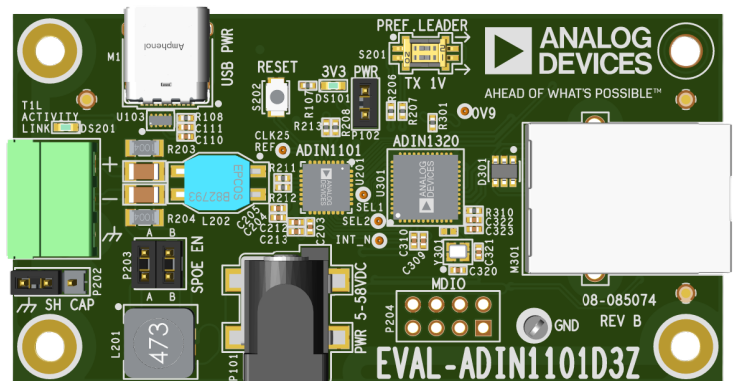


Figure 1. EVAL-ADIN1101D3Z Evaluation Board Photograph

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REVISION HISTORY

5/2026—Revision 0: Initial Version

OVERVIEW

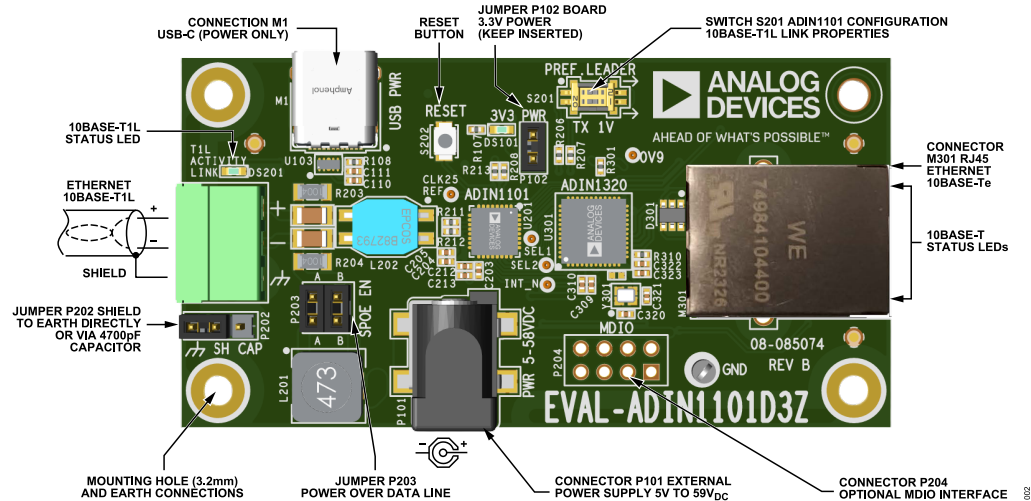


Figure 2. Board Connectors and Controls

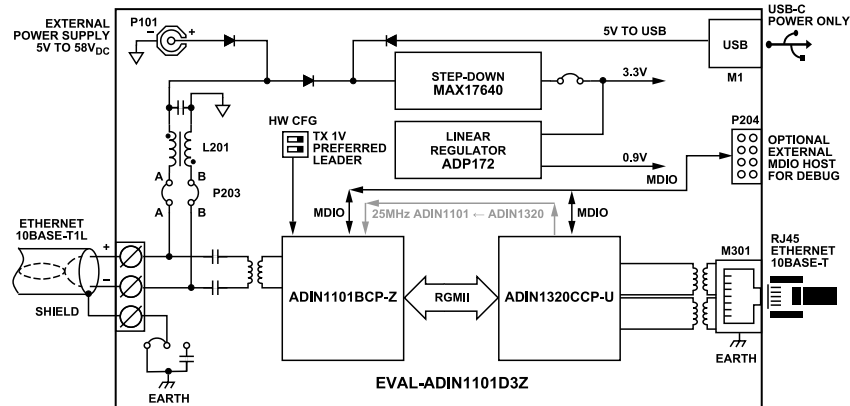


Figure 3. Simplified Block Diagram

Table 1. Board Interface Components

Reference	Name	Description
P101	PWR 5V to 58V _{DC}	Power barrel for external 5V _{DC} to 58V _{DC} power supply.
P201	-	10BASE-T1L single-pair Ethernet connector, PoDL 5V to 58V _{DC} in/out.
P204	MDIO	Optional MDIO for PHY management and debug access.
M1	USB PWR	USB 5V board power supply (no data).
M301	-	10BASE-T RJ45 Ethernet connector.

Table 2. Board Control Components

Reference	Name	Description
P102	PWR	Jumper for local 3.3V power. Keep inserted for normal operation.
P202	-	Jumper for 10BASE-T1L cable shield to connect to earth directly or via a 4700pF capacitor.
P203	PoDL	Jumpers for engineered power coupling. Keep inserted for coupling power to or from the 10BASE-T1L port. Correct jumper placement on headers is A to A, B to B.
S201	ADIN1101 HW CFG Switch (TX 1V)	10BASE-T1L transmit voltage level. On: 10BASE-T1L operates with a 1V signal level. Off: 10BASE-T1L operates with a 2.4V signal level. The switch must be set to the desired position before power-up or reset.

OVERVIEW**Table 2. Board Control Components (Continued)**

Reference	Name	Description
S201	ADIN1101 HW CFG Switch (PREF.LEADER)	10BASE-T1L PHY leader/follower configuration. On: ADIN1101 leader preferred on the 10BASE-T1L link. Off: ADIN1101 follower preferred on the 10BASE-T1L link. The switch must be set to the desired position before power-up or reset.
S202	RESET	Push-button for board hardware reset.

Table 3. Board Indicator Components

Reference	Name	Color	Description
DS101	3V3	Green	Board local 3.3V power. Lit when the board is powered from any source.
DS201	T1L Activity Link	Green	10BASE-T1L Ethernet link up.
M301	-	Green	10BASE-T Ethernet link (data) activity (light-emitting diode (LED) integrated in RJ45 connector).
M301	-	Yellow	10BASE-T Ethernet link up (LED integrated in RJ45 connector).

DETAILED DESCRIPTION

MEDIA CONVERSION

The EVAL-ADIN1101D3Z performs media conversion between a standard 10BASE-T/10BASE-T RJ45 Ethernet port and a 10BASE-T1L Ethernet port. This is implemented as a back-to-back connection using reduced gigabit media independent interface (RGMII) between the [ADIN1101](#) (U201) and [ADIN1320](#) (U301). The data (Ethernet frames) are passed directly from one PHY to the other PHY. There are no media access controller (MAC), buffer, or speed conversion in the data path on the board.

The board is microcontroller-less, which means both the ADIN1101 and the ADIN1320 are configured optionally by hardware and are set by pull-up and pull-down resistors. Both the ADIN1101 and the ADIN1320 can also be configured by the management data input/output (MDIO) interface (via the external MDIO). The ADIN1320 is also configured to advertise autonegotiation of 10Mb full duplex as the only capability on the RJ45 Ethernet port.

When the EVAL-ADIN1101D3Z is connected to a 10BASE-T/10BASE-T/100BASE-T/1000BASE-T Ethernet port of another device, the devices agree through autonegotiation to link up at 10Mb full duplex to match exactly the speed and mode of the 10BASE-T1L link. Most common devices, such as PCs with an Ethernet port, USB to Ethernet adapters, Ethernet switches, or industrial controllers, have the Ethernet port set, by default, for autonegotiation. As a result, the Ethernet link operates correctly with the EVAL-ADIN1101D3Z.

10BASE-T1L CONNECTION

The 10BASE-T1L cable can be connected via a pluggable screw terminal block to Connector P201. If more of the pluggable connectors are needed for easy connecting or changing of cables, additional connectors can be purchased from vendors or distributors, such as: Phoenix Contact, Part Number 1803581, which is a pluggable, 3-way, 3.81mm, 28AWG to 16AWG, 1.5mm, two screw terminal block.

10BASE-T/ETHERNET CONNECTION

The Ethernet cable with a standard 8-pin RJ45 Ethernet connector (provided in the evaluation kit) connects to the M301 10BASE-T connector.

POWER SUPPLY

The board is supplied by an external power supply source with an output voltage between 5V to 58V_{DC}, connected via the 2mm/5.50mm power barrel to the P201 connector. Alternatively, the board can be powered from a host via its USB port to the USB-C connector M1 that provides 5V_{DC} to the board.

The input voltage is converted to 3.3V by the [MAX17640](#) step-down switching buck converter that supplies the rest of the circuitry. Afterward, the 3.3V is converted to 0.9V using the [ADP172ACBZ-0.9](#) linear regulator that provides 0.9V to the ADIN1320 chip. The presence of 3.3V power is indicated by the 3V3 PWR green LED.

While the board does not have polarity correction, it does have polarity protection. Both the power barrel and USB-C are protected with 60V diodes, D105 and D101, preventing voltage damage to the barrel connector, USB-C, and MAX17640 step-down converter. Additionally, another 60V diode D102 was added to power the coupling inductor node to protect MAX17640 step-down converter from damage. If the voltage drops below 5V, the undervoltage lockout circuit on the step-down converter will not power up the board. Power supply circuitry also contains resettable PTC 60V fuses, F101 and F102, capable of holding maximum of 750mA.

USB Port

The EVAL-ADIN1101D3Z USB-C connector is connected to a PC or other host USB ports, using either a USB-A to USB-C cable (provided in the evaluation kit), or a USB-C to USB-C cable (presently not provided in the kit). The USB-C port (M1) is for power only, providing 5V to the board, and this USB port cannot be used to provide engineered power to another device through 10BASE-T1L data line using the engineered power coupling feature of the board.

Power To 10BASE-T1L Over SPE

The EVAL-ADIN1101D3Z provides engineered power to 10BASE-T1L over the same single pair cable as the data by enabling power coupling inductor (L201). To enable the power coupling inductor, place two jumpers on SPOE EN headers (P203) vertically. The engineered power is disabled by removing both jumpers from SPOE EN headers (P203). When engineered power coupling is enabled, and the device is powered via data line, the maximum current is limited by the saturation current (0.61A) of the inductor L201.

GROUND CONNECTIONS

The EVAL-ADIN1101D3Z board has an earth connection point. Although this board may or may not be electrically connected to the earth ground in a device, this board is typically connected to the device metal housing or chassis. This earth point is connected via an exposed metal plating of three M3 mounting holes in the corners of the EVAL-ADIN1101D3Z board. The fourth hole does not have metal plating and has no earth connection (located on the top right, next to the Analog Devices, Inc., logo).

The shield of the 10BASE-T1L cable is either disconnected from the earth point, connected directly, or connected via 4700pF (3000V) capacitor (C208) by installing or removing a jumper on or from header P202.

The external power supply P101 (power barrel) is connected to the earth node via 1000pF (3000V) capacitors and the 10BASE-T1L terminal is connected to the earth node via 100pF (3000V) capacitors for both positive (+) and negative (–) end of terminal.

The 10BASE-T earth connection, together with the metal body of the RJ45 connector (M301), are connected directly to the earth point.

DETAILED DESCRIPTION

The local ground of the board circuitry is connected to the earth point via approximately 4.7MΩ of resistance (R209 bleeder resistor) for preventing buildup of charge on the capacitance.

Note that the EVAL-ADIN1101D3Z was designed only as an evaluation board. It was not designed nor tested for electrical safety. Any equipment, device, wire, or cable connected to the EVAL-ADIN1101D3Z board must be already protected and safe to touch without danger of electric shock.

OPTIONAL MDIO CONNECTION

The ADIN1101 and ADIN1320 PHYs can be optionally monitored and managed by an external controller via MDIO management interface (P204). To access the optional management, first a suitable connector must be assembled on the board. The MDIO pinout with description can be found in Table 4.

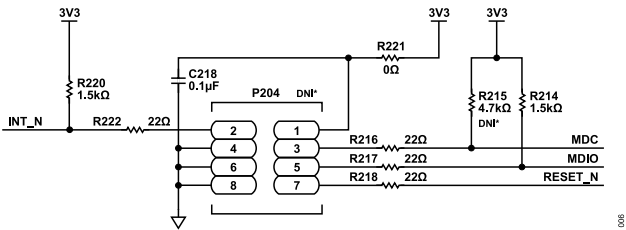


Figure 4. MDIO Interface with Pull-Up Resistors

Table 4. MDIO Pinout

Connector Pin#	Board Signal	Pull-Up Resistor	Description
1	3V3	N/A	Powers up external device
2	INT_N	1.5kΩ	Management interface interrupt pin output
3	MDC	4.7kΩ (DNI) ¹	Management data clock input up to 2.5MHz
4	GND	N/A	GND pin connected to local ground
5	MDIO	1.5kΩ	Management data input and/or output synchronous to the MDC clock
6	GND	N/A	GND pin connected to local ground
7	RESET_N	N/A	Hardware reset; active low input
8	GND	N/A	GND pin connected to local ground

¹ Do not insert. By default, component not assembled on the board.

BOARD OPERATION

USING BOARD AS MEDIA CONVERTER
(WITHOUT POWER COUPLING)

The example in Figure 5 shows the EVAL-ADIN2111EBZ board acting as an instrument/network node with 10BASE-T1L interface connected via the media converter EVAL-ADIN1101D3Z to a host with a standard Ethernet port. The instrument node (the EVAL-ADIN2111D1Z in this example) is locally powered from an

external power supply per its specification. The power coupling on the EVAL-ADIN1101D3Z board is disabled by removing both jumpers from position P203, and the EVAL-ADIN1101D3Z can be powered from either an external 5V to 58V power supply connected to connector P101 or from a 5V power supply via a USB-C connector M1.

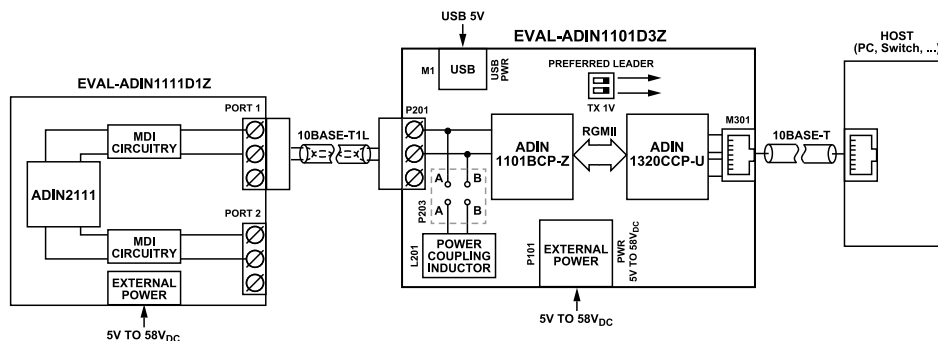


Figure 5. Block Diagram of Media Conversion

BOARD OPERATION

USING BOARD POWER COUPLING

The example in Figure 6 is similar to the previous example, but the instrument/node EVAL-ADIN2111D1Z is powered via the 10BASE-T1L cable. The engineered power coupling on the EVAL-ADIN1101D3Z needs to be enabled by inserting the two jumpers into the P203 headers, connecting the positions (A to A) and (B to B) as shown in the Figure 6. Note that if the jumpers were incorrectly placed connecting positions A to B, it leads to a short circuit on the power supply and the system does not work.

An external power supply connected to the P101 connector on the EVAL-ADIN1101D3Z will supply the whole system. The power supply is passed from the P101 via the basic protection of a Schottky diode, PTC fuse, and a power coupling inductor L201 to the 10BASE-T1L cable. Therefore, the external power supply voltage must not only be within the EVAL-ADIN1101D3Z specified range, but it must also be acceptable for the connected instrument,

including consideration of voltage drop on the EVAL-ADIN1101D3Z board, typically 1.44V, and voltage drop over the 10BASE-T1L cable.

The maximum current that can be passed from the external power supply to the 10BASE-T1L cable is limited by the properties of power coupling inductor L201 used on the EVAL-ADIN1101D3Z board. The inductor currently placed on the board by default has specified saturation current of 0.61A for both windings, and therefore the instruments supplied via the EVAL-ADIN1101D3Z must not exceed that value. Also, the external power supply needs to be capable of providing the combined power supply current for both the EVAL-ADIN1101D3Z and the instruments supplied via the 10BASE-T1L cable.

Note that EVAL-ADIN1101D3Z cannot be powered via the USB-C connector (M1 in this case).

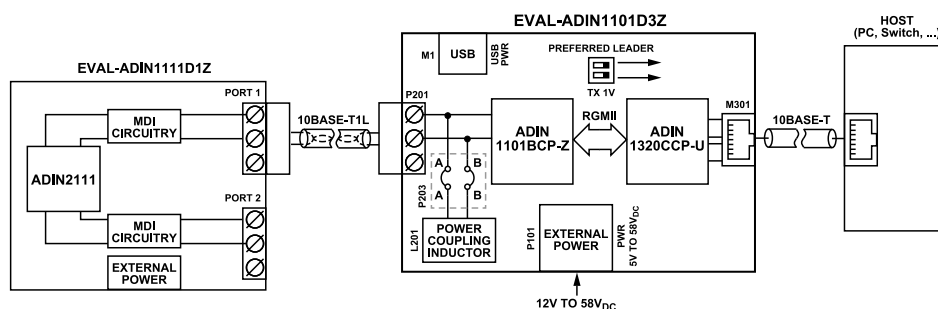


Figure 6. Block Diagram of Media Conversion with Power Forwarding

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.

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