User's Guide
TLIN1021A-Q1 and TLIN1027-Q1 Evaluation Module

TEXAS INSTRUMENTS

ABSTRACT

The TLINx021A-Q1 and TLINx027-Q1 evaluation mode (EVM) is described in this user's guide. This EVM helps designers evaluate device performance, support fast development, and analyze automotive local interconnect network (LIN) systems using TLIN1021A-Q1, TLIN2021A-Q1, TLIN1027-Q1, and TLIN2027-Q1 LIN physical layer transceiver devices.
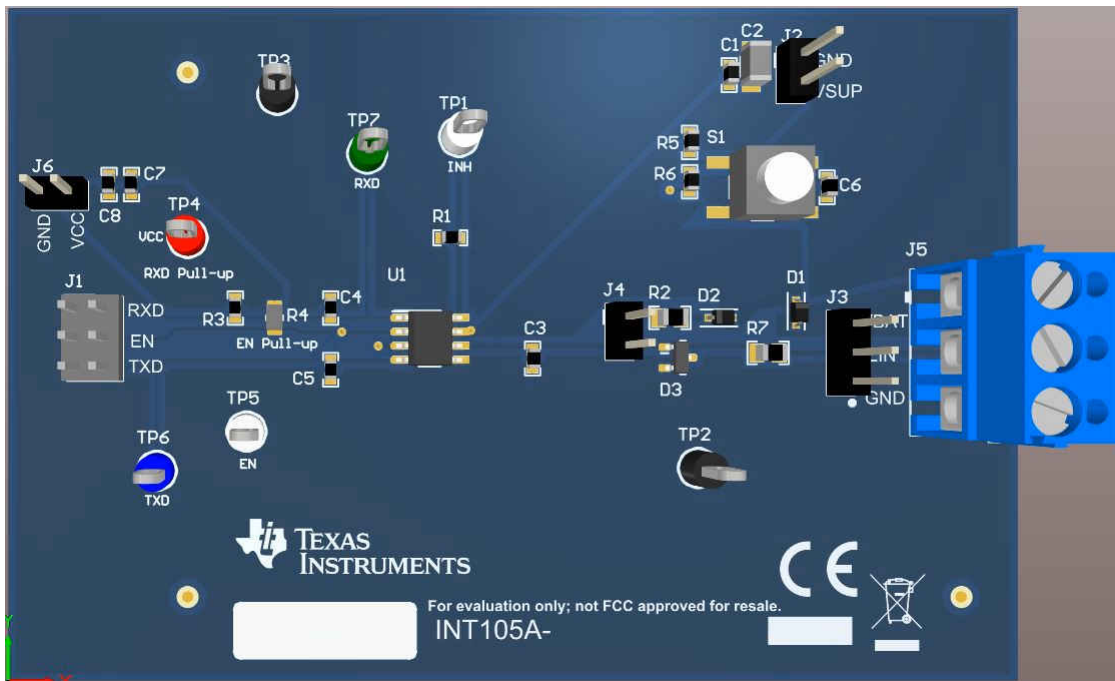
Figure 1-1. TLIN1021DEVM Board Image

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1 Introduction

1.1 Features

This EVM supports the following features:

- Commander mode and Responder mode configurations
- Terminal block and headers pins are available on all power and LIN bus connections
- Optional VCC rail and pull-up resistors for EN input and RXD output
- A push-button circuit to engage local wake on the WAKE pin (TLIN1021A-Q1)

1.2 Description

The TLIN1021DEVM provides users with the ability to evaluate the TI TLINx021A-Q1 and TLINx027-Q1 single-channel, LIN transceivers. The EVM allows both commander and responder mode applications to be evaluated through the use of a single jumper that connects or disconnects the external 1-kΩ pullup resistor and series diode required in commander mode from the LIN bus.

The EVM has a low-voltage VCC rail that provides the voltage to the pull-up resistors on the received data (RXD) open-drain output, and enable (EN) control input pins. The TLINx021A-Q1 and TLINx027-Q1 support a V_{IH} from 2-V to 5.5-V, allowing operation with a variety of microcontrollers with common IO voltage levels such as 2.5-V, 3.3-V, and 5-V. Non-populated capacitor pads are available on the TXD and RXD pins to accommodate a variety of different tests requiring various capacitive load conditions.

The TLINx021A-Q1 and TLINx027-Q1 families support both 12-V and 24-V automotive applications. The TLIN1021A-Q1 and TLIN2027-Q1 devices both operate with a V_{SUP} from 4.5-V to 36-V and have ±45-V LIN bus fault protection. Use the EVM to evaluate the TLIN1021A-Q1 or TLIN1027-Q1 device for 12-V automotive applications. The TLIN2021A-Q1 and TLIN2027-Q1 devices both operate with a V_{SUP} from 4.5-V to 45-V and have ±60-V bus fault protection. Use the TLIN2021A-Q1 or the TLIN2027-Q1 device for 24-V automotive applications. See the device data sheets for specific information regarding recommended operating conditions.

Furthermore, the TLINx021A-Q1 transceivers include internally-protected bus terminals with greater than ±8-kV HBM and IEC ESD protection levels. If additional ESD protection is desired, a MMBZ27VCL diode is populated on the LIN bus. This can easily be removed to test other ESD diodes as well, as it is the common SOT23 package for ESD diodes. Both headers and wire-terminals are provided on the power and LIN bus connections to allow the EVM to be evaluated in a larger system while still allowing for test equipment to be connected to the signals under test.

2 EVM Setup and Requirements

Use the following equipment to evaluate the performance of the TLINx021A-Q1 device:

- Power supply capable of supplying the desired supply voltage. Typical LIN applications use 12-V or 24-V, but the TLIN1021A-Q1 operates with any supply voltage from 4.5-V to 36-V. Connect this voltage across the VBAT and GND pins of either the J2, J3, or J5 connectors.
- Power supply capable of supplying the desired IO pin voltage from 2-V to 5.5-V. Connect this voltage across the VCC and GND pins of the J6 connector.
- If the LIN bus interface or the INH pin is to be observed on an oscilloscope, use probes capable of tolerating voltages as large as VBAT.
- The logic interface pins (TXD: TP6, RXD: TP7, and EN: TP5) may interface to a microcontroller, pattern generator, or logic analyzer with logic levels matching the VCC voltage.

2.1 Commander Mode

To configure the board for commander mode, place a shunt on J7 to connect the external 1-kΩ resistor and series diode to the LIN bus per the LIN specification.

2.2 Responder Mode

To configure the board for responder mode, remove the shunt on J7 to disconnect the external 1-kΩ resistor and series diode from the LIN bus per the LIN specification.

2.3 Push-button Wake

To use the push-button Wake circuit, push down on the S2 button while the device is in sleep mode to transition it back to standby mode.
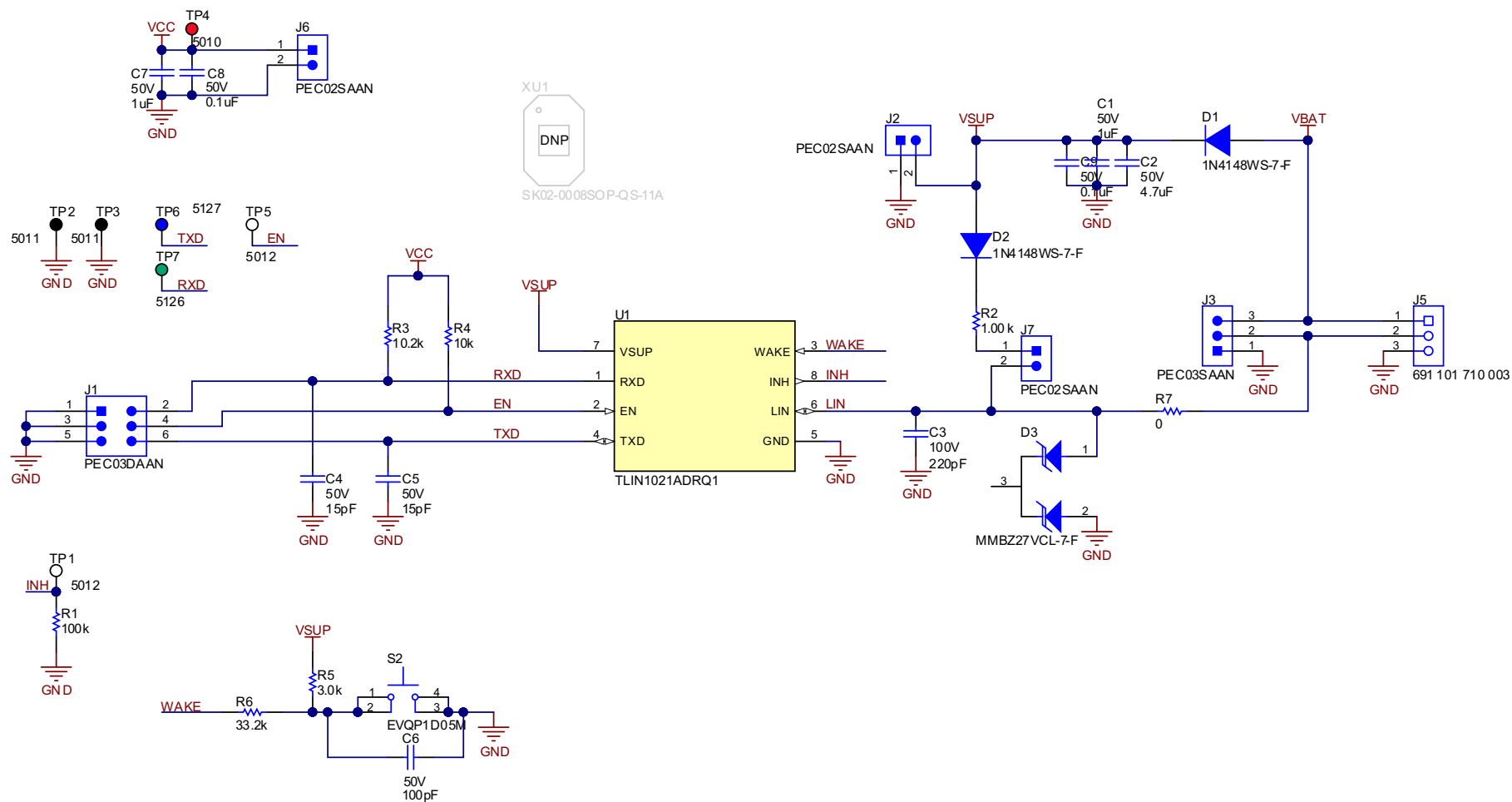
3 Schematic and Bill of Materials

Figure 3-1. Schematic

Table 3-1. Bill of Materials

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer	Alternate[1] Part Number	Alternate Manufacturer
PCB	1		Printed Circuit Board		INT105B	Any		
C1, C7	2	1 µF	CAP, CERM, 1 µF, 50 V, ± 10%, X7R, 0603	0603	UMK107AB7105KA-T	Taiyo Yuden		
C2	1	4.7 µF	CAP, CERM, 4.7 µF, 50 V, ± 20%, X7R, 1206_190	1206_190	C3216X7R1H475M160AC	TDK		
C3	1	220 pF	CAP, CERM, 220 pF, 100 V, ± 10%, X7R, 0603	0603	06031C221KAT2A	AVX		
C4, C5	2	15 pF	CAP, CERM, 15 pF, 50 V, ± 5%, C0G/NP0, 0603	0603	885012006052	Wurth Elektronik		
C6	1	100 pF	CAP, CERM, 100 pF, 50 V, ± 1%, C0G/NP0, 0603	0603	06035A101FAT2A	AVX		
C8	1	0.1 µF	CAP, CERM, 0.1 µF, 50 V, ± 10%, X7R, 0603	0603	C1608X7R1H104K080AA	TDK		
C9	1	0.1 µF	CAP, CERM, 0.1 µF, 50 V, ± 5%, X7R, 0805	0805	C0805C104J5RACTU	Kemet		
D1, D2	2	75 V	Diode, Switching, 75 V, 0.15 A, AEC-Q101, SOD-323	SOD-323	1N4148WS-7-F	Diodes Inc.		
D3	1	27 V	Diode, TVS, Uni, 27 V, 38 Vc, SOT-23	SOT-23	MMBZ27VCL-7-F	Diodes Inc.		
H9, H10, H11, H12	4		Bumpon, Hemisphere, 0.44 X 0.20, Clear	Transparent Bumpon	SJ-5303 (CLEAR)	3M		
J1	1		Header, 100mil, 3x2, Tin, TH	3 × 2 Header	PEC03DAAN	Sullins Connector Solutions		
J2, J6, J7	3		Header, 100mil, 2x1, Tin, TH	Header, 2 PIN, 100 mil, Tin	PEC02SAAN	Sullins Connector Solutions		
J3	1		Header, 100mil, 3x1, Tin, TH	Header, 3 PIN, 100 mil, Tin	PEC03SAAN	Sullins Connector Solutions		
J5	1		Terminal Block, 5 mm, 3x1, Tin, TH	Terminal Block, 5 mm, 3 × 1, TH	691 101 710 003	Wurth Elektronik		
LBL1	1		Thermal Transfer Printable Labels, 0.650" W x 0.200" H - 10,000 per roll	PCB Label 0.650 × 0.200 inch	THT-14-423-10	Brady		
R1	1	100k	RES, 100 k, 5%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	ERJ-3GEYJ104V	Panasonic		
R2	1	1.00k	RES, 1.00 k, 1%, 0.125 W, AEC-Q200 Grade 0, 0805	0805	ERJ-6ENF1001V	Panasonic		
R3	1	10.2k	RES, 10.2 k, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	CRCW060310K2FKEA	Vishay-Dale		
R4	1	10k	RES, 10 k, 5%, 0.125 W, AEC-Q200 Grade 0, 0805	0805	CRCW080510K0JNEA	Vishay-Dale		
R5	1	3.0k	RES, 3.0 k, 5%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	CRCW06033K00JNEA	Vishay-Dale		
R6	1	33.2k	RES, 33.2 k, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	CRCW060333K2FKEA	Vishay-Dale		
R7	1	0	RES, 0, 5%, 0.125 W, AEC-Q200 Grade 0, 0805	0805	CRCW08050000Z0EA	Vishay-Dale		
S2	1		Switch, Tactile, SPST-NO, 0.05A, 12V, SMT	6 × 5 × 6 mm	EVQP1D05M	Panasonic		
TP1, TP5	2		Test Point, Multipurpose, White, TH	White Multipurpose Testpoint	5012	Keystone		
TP2, TP3	2		Test Point, Multipurpose, Black, TH	Black Multipurpose Testpoint	5011	Keystone		
TP4	1		Test Point, Multipurpose, Red, TH	Red Multipurpose Testpoint	5010	Keystone		
TP6	1		Test Point, Multipurpose, Blue, TH	Blue Multipurpose Testpoint	5127	Keystone		
TP7	1		Test Point, Multipurpose, Green, TH	Green Multipurpose Testpoint	5126	Keystone		
U1	1		Fault-Protected LIN Transceiver with Inhibit and Wake	SOIC8	TLIN1021ADRQ1	Texas Instruments	TLIN1021ADQ1	Texas Instruments
FID1, FID2, FID3	0		Fiducial mark. There is nothing to buy or mount.	N/A	N/A	N/A		
XU1	0		Socket, SOP-8, 1.27 mm	Socket, IC	SK02-0008SOP-QS-11A	RS Tech Incorparated		

(1)   Unless otherwise noted in the Alternate PartNumber and/or Alternate Manufacturer columns, all parts may be substituted with equivalents.

4 Revision History

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

Changes from Revision * (May 2019) to Revision A (February 2022) **Page**

- Updated the numbering format for tables, figures, and cross-references throughout the document..................2
- Changed all instances of legacy terminology to commander and responder where LIN is mentioned............. 2

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