



## ABSTRACT

The TMUXHS221/LV evaluation module (EVM) can be used to evaluate many high-speed interfaces for data rates up to 3Gbps, such as USB 2.0 and eUSB2 LS, FS, and HS signaling. This user's guide details how to set up and configure the EVM to test functionality and signal integrity.

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## Trademarks

All trademarks are the property of their respective owners.

## 1 Introduction

TMUXHS221/LV is a high-speed bidirectional 2:1/1:2 mux/demux optimized for USB 2.0 and eUSB2 LS, FS, and HS signaling. TMUXHS221 and TMUXHS221LV offer different voltage levels for control logic and require different supply voltage values. TMUXHS221 supports differential and single ended CMOS signaling with a voltage range of -0.3 V to 3.6 V and 1.8 V control logic. TMUXHS221LV supports differential and single ended CMOS signaling with a voltage range of -0.3 V to 1.8 V and 1.2 V control logic. [Figure 1-1](#) shows that both devices provide switching on differential channels between Port D to DA or Port D to DB.

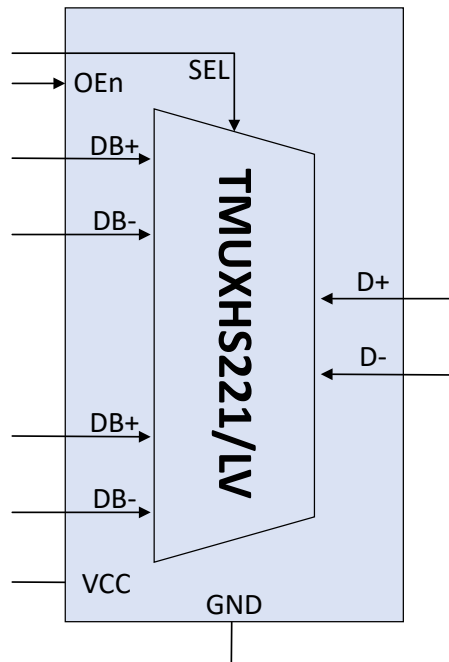


Figure 1-1. TMUXHS221/LV Functional Block Diagram

## 2 Setup and Configuration

[Figure 2-1](#) shows a top view photo of the EVM.

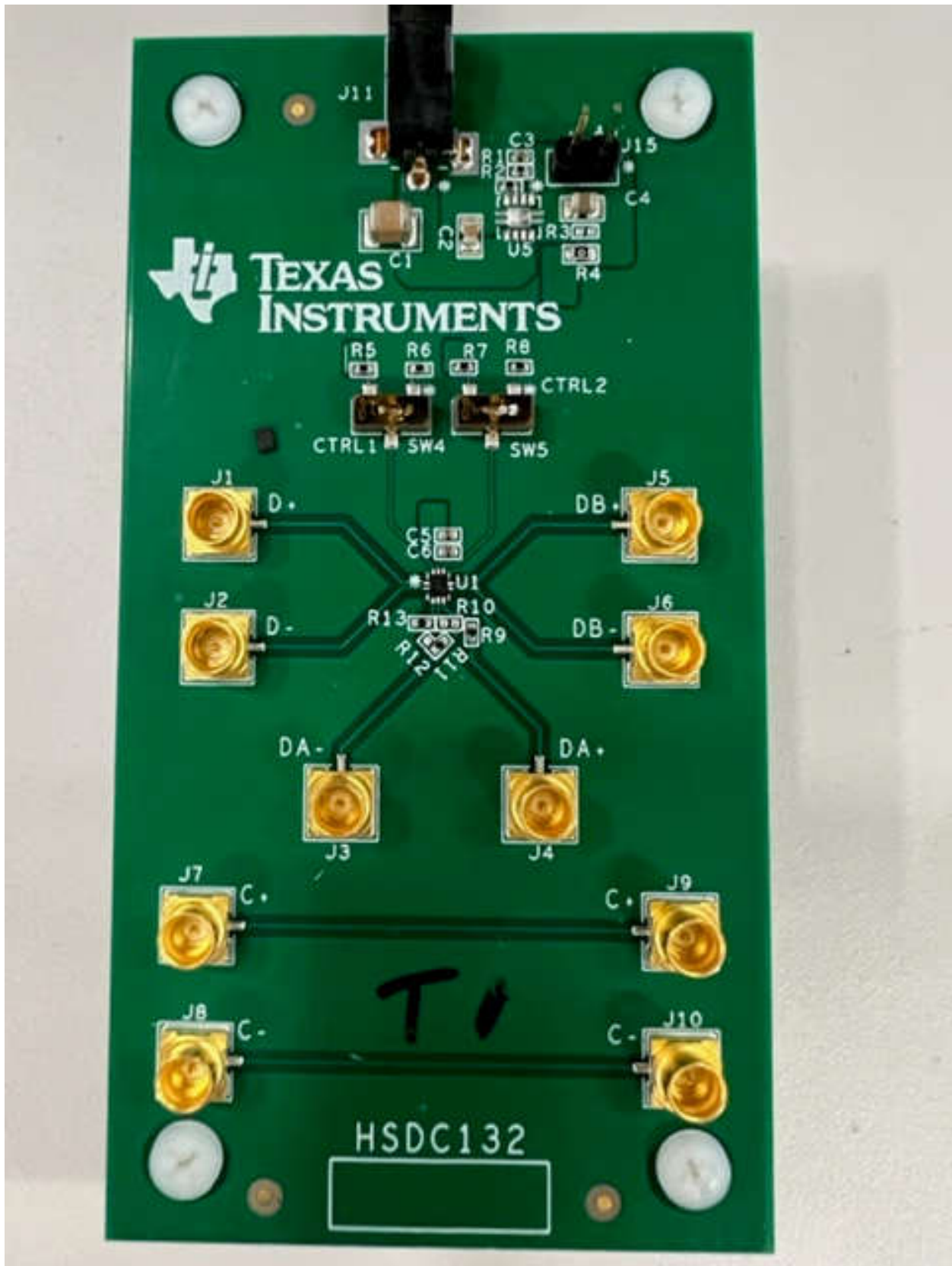


Figure 2-1. TMUXHS221/LV EVM

## 2.1 Signal Connection

The EVM provides SMP receptacles for the high-speed signal connections. Each SMP receptacle is labeled with the signal's port (D, DA, or DB) and polarity (+ or -). SMA to SMP cables are required to connect and test equipment or fixtures. The signal traces are all equal length and have 45  $\Omega$  single-ended impedance.

## 2.2 AC Coupling Capacitors

USB2 is DC coupled; there is no AC capacitors on this EVM.

## 2.3 Jumper Configuration

SEL (SW4) and OEn (SW5) controls the function mode of the TMUXHS221/LV device. [Table 2-1](#) lists the mux configuration control logic.

**Table 2-1. Mux Configuration Control Logic**

SEL(SW4)	OEn(SW5)	Mux Configuration
L	L	D to DA
H	L	D to DB
x	H	HiZ

## 2.4 Power

The TMUXHS221 EVM is designed to operate from an external 5 V power supply using DC jack J11, or a 3.3V external power supply directly applied to J15. The TMUXHS221LV EVM is designed to operate from a 1.8V external power supply directly applied to J15. A power supply current limit of 200 mA is more than adequate to power either EVM.

## 2.5 Calibration

The EVM provides a pair of calibration traces to allow the EVM to de-embed from the TMUXHS221/LV chip during measurement. The calibration traces are length matched to the combined length of the input and output traces to the TMUXHS221/LV.

## 2.6 REACH Compliance

### Note

This EVM includes one or more of the components containing at least one Substance of Very High Concern (SVHC) above 0.1%, which is in compliance with Article 33 provision of the EU REACH regulation. These uses from Texas Instruments do not exceed 1 ton per year. [Table 2-2](#) provides the SVHC.

**Table 2-2. Component List**

Component manufacturer	Component type	Component part number	SVHC Substance	SVHC CAS (when available)
Rosenberger	Connector	19S101-40ML5	Lead	7439-92-1

### 3 Schematics

Figure 3-1 shows the EVM schematic.

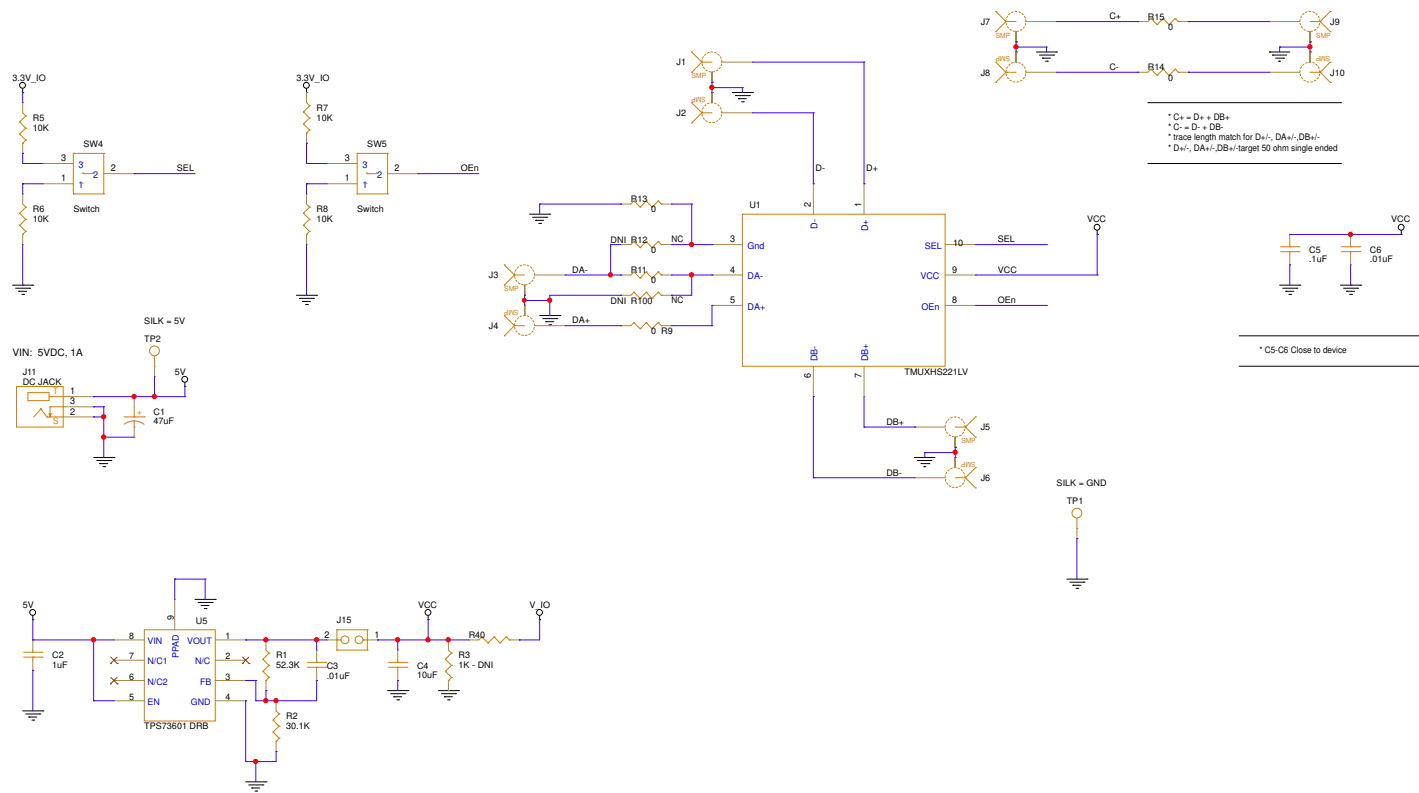


Figure 3-1. EVM Schematic

## 4 Bill of Materials

Table 4-1 shows the EVM Bill of Materials.

**Table 4-1. TMUXHS221/LV EVM BOM**

Item	Quantity	Reference	Value	Manufacturer	Part Number	Footprint
1	1	C1	47 $\mu$ F	TDK	C3225X5R1A476M250AC	cap_1210
2	1	C2	1 $\mu$ F	KEMET	C0805C105K4RACTU	cap_805
3	2	C3, C6	0.01 $\mu$ F	KEMET	C0402C103K3RACTU	cap_402
4	1	C4	10 $\mu$ F	KEMET	C0805C106K8PACTU	cap_805
5	1	C5	0.1 $\mu$ F	YAGEO	C0402KRX5R6BB104	cap_402
6	10	J1, J2, J3, J4, J5, J6, J7, J8, J9, J10	SMP	Rosenberger	19S101-40ML5	CON_SMVT_19S101-40ML5_R04350
7	1	J15	HDR2X1	Sullins	PEC02SAAN	HDR_THVT_1X2_254_871
8	1	J11	DC JACK	CUI	PJ1-022-SMT-TR	JACK_SMRT_PJ1-022-SMT-TR
9	1	PCB1	HSDC132B	Any	HSDC121	n/a
10	1	R1	52.3K	Yageo	RC0402FR-0752K3L	res_0402
11	1	R2	30.1K	Yageo	RT0402BRD0730K1L	res_0402
12	1	R3	1K-DNI	Yageo	RT0402BRE071KL	res_0402
13	1	R4	0	Yageo	RC0603JR-070RL	res_0603
14	4	R5, R6, R7, R8	10K	Yageo	RT0402BRD0710KL	res_0402
15	7	R9,R11,R13,R14,R15	0	Yageo	RT0402BRD0710KL	res_0402
16	4	SCRW1, SCRW2, SCRW3, SCRW4	NY PMS 440 005 PH	B&F Fastener	NY PMS 440 005 PH	screw
17	6	SHNT1, SHNT2, SHNT3, SHNT4, SHNT5, SHNT6	QPC02 SXGN-RC	Sullins	QPC02SXGN-RC	0.1
18	4	STDOFF1, STDOFF2, STDOFF3, STDOFF4	1902E	Keystone	1902E	Standoff
19	2	SW4, SW5	Switch	Nidec Copal	CJS-1201TB	SW_SMVT_CJS-1201B
20	2	TP1,TP2	TP_sm127c_0			Testpad_sm127c_no-sp
20	1	U1	TMUXHS221/LV	Texas Instruments	TMUXHS221/LV	RMG0012AA
21	1	U5	TPS73601 DRB	Texas Instruments	TPS73601DRB	DRB0008BA_150x175

## 5 Revision History

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

<b>Changes from Revision * (August 2022) to Revision A (July 2023)</b>	<b>Page</b>
• Changed all mention of <i>TMUXHS221</i> to <i>TMUXHSS221/LV</i> in document.....	<a href="#">1</a>
• Changed <i>TMUXHS221/LV Functional Block Diagram</i> in <i>Introduction</i> section.....	<a href="#">2</a>
• Changed <i>Power</i> section.....	<a href="#">4</a>
• Changed schematic.....	<a href="#">5</a>

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