TMUXHS4212 Evaluation Module User's Guide

The TMUXHS4212 evaluation module (EVM) can be used to evaluate high-speed bidirectional passive switching for USB Type-C™ mux or demux applications supporting USB 3.x Gen 1/2 data rates. It is also compatible with MIPI® DSI/CSI, LVDS, and PCI Express® Gen 1/2/3/4 interface standards. This user guide describes how to setup and configure the EVM to test functionality and signal integrity.

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Trademarks

MIPI is a registered trademark of MIPI Alliance, Inc.
PCI Express is a registered trademark of PCI-SIG.
USB Type-C is a trademark of USB Implementers Forum.

1 Introduction

The TMUXHS4212 is a 2-channel high-speed mux/demux switch that is compatible with any high-speed interface with a differential amplitude < 1800 mVpp and a common mode voltage < 2 V. The device provides switching on differential channels between Port B or Port C to Port A (see Figure 1)
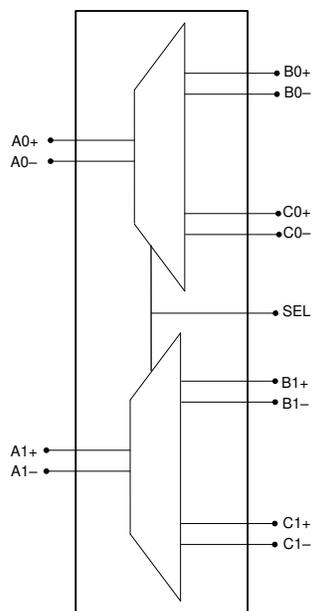

Figure 1. TMUXHS4212 Functional Block Diagram

2   Setup and Configuration

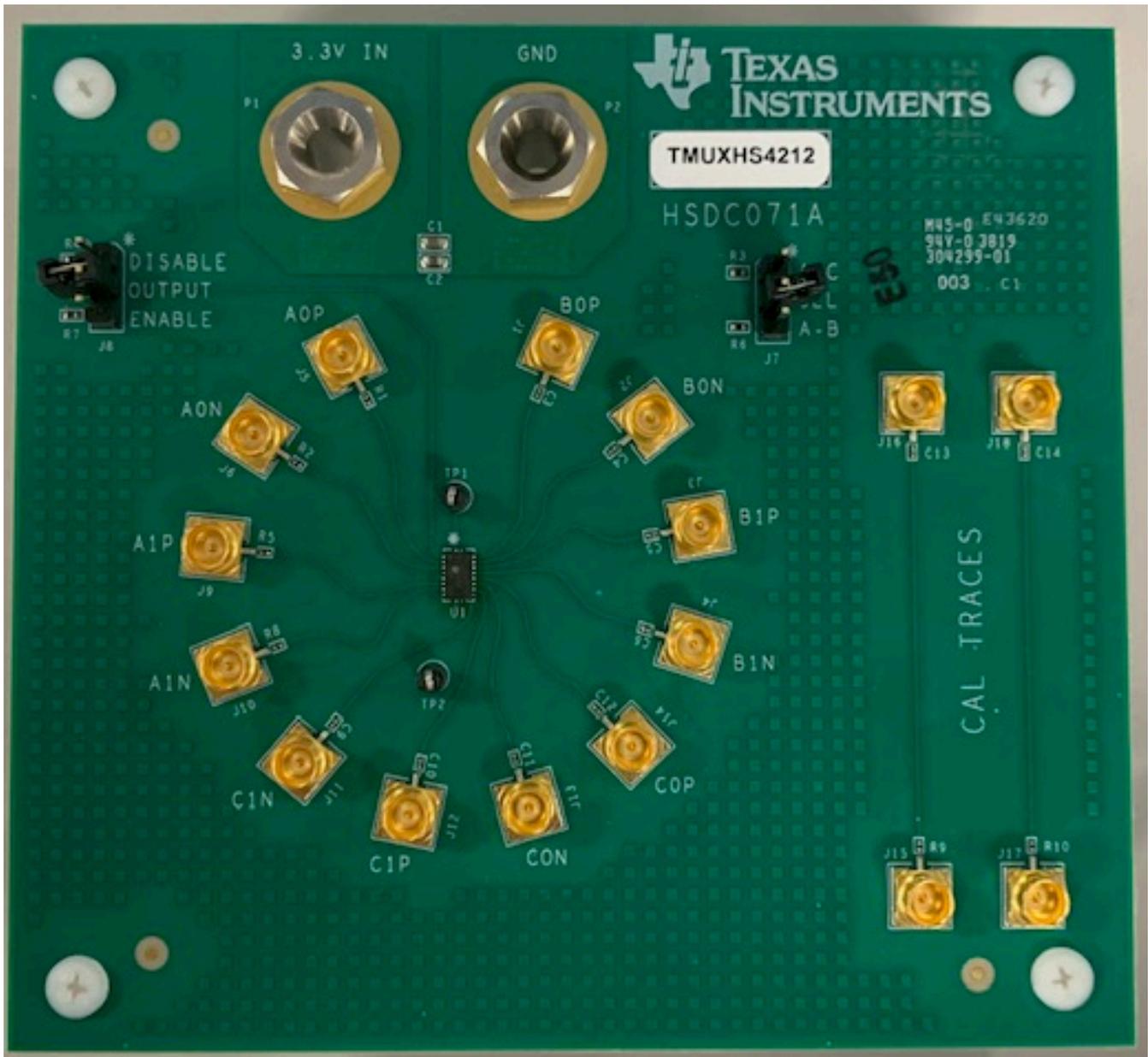Figure 2 shows a top view photo of the EVM.

Figure 2. TMUXHS4212EVM

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 (A, B, or C), channel (0 or 1), and polarity (P or N). SMA to SMP cables may be required to connect to test equipment or fixtures. The signal traces are all equal length and have 50 Ω single-ended impedance.

2.2 AC Coupling Capacitors

Most interfaces require AC coupling between the transmitter and receiver. The USB 3.1 specification requires AC coupling capacitors in the range of 75 - 265 nF for Gen 1 and Gen 2 speeds. By default, the EVM is populated with 220 nF AC coupling capacitors on Ports B and C. The 220 nF value was chosen over the more typical 100 nF value to maintain spec compliance when the host or device attached to the EVM also has a capacitor in series. Port A is populated with 0 Ω resistors which can be replaced with capacitors if needed. However, the TMUXHS4212 switch requires a bias voltage so capacitors cannot be placed on both sides of the switch unless an external bias voltage of < 2 V is provided. The TMUXHS4212 Two-Channel Differential 2:1/1:2 USB3.1 Mux/Demux datasheet has additional information about implementing coupling capacitors and bias voltage for various applications.

2.3 Jumper Configuration

The TMUXHS4212 is controlled by an active-low enable signal and a port select signal. Jumper J8 is used to enable or disable the switch. Jumper J7 controls the port selection: Port A to Port B, or Port A to Port C. Both jumpers and their operational positions are labeled with silkscreens on the EVM for ease of use.

2.4 Power

The EVM is designed to operate from an external 3.3 V power supply using standard banana jack plug cables. Terminal P1 should be connected to the supply positive output and P2 to ground. A power supply current limit of 100 mA is more than adequate to power the EVM.

2.5 Calibration

The EVM provides a pair of calibration traces to allow the EVM to be de-embedded from the TMUXHS4212 chip during measurement. The calibration traces are length matched to the combined length of the input and output traces to the TMUXHS4212. They are also populated with the same capacitors and resistors.

2.6 REACH Compliance

In compliance with the Article 33 provision of the EU REACH regulation we are notifying you that this EVM includes component(s) containing at least one Substance of Very High Concern (SVHC) above 0.1%. These uses from Texas Instruments do not exceed 1 ton per year. The SVHC is shown in Table 1:

Table 1. 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 shows the EVM schematic.

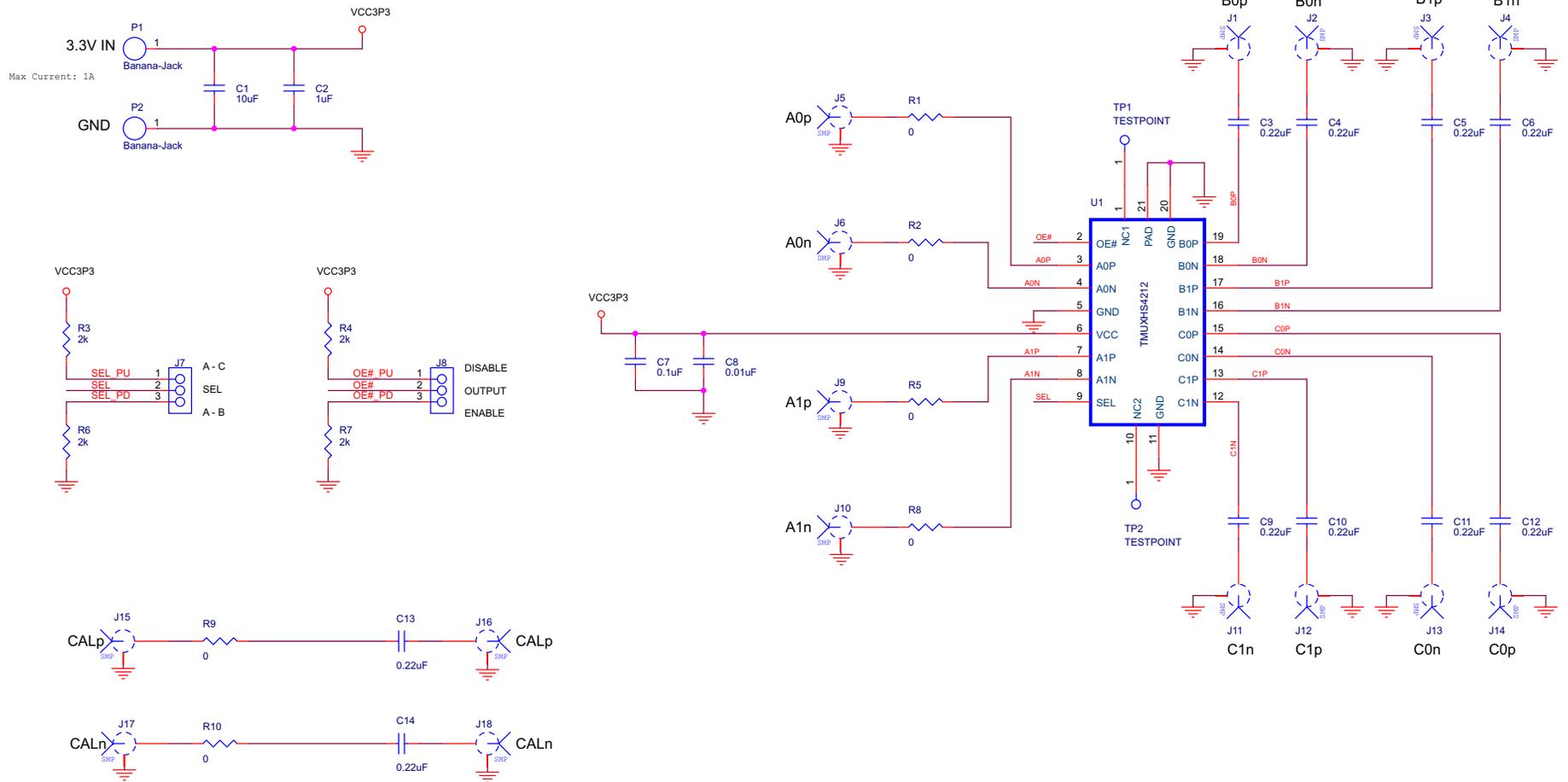**Figure 3. TMUXHS4212EVM Schematic**

4   Bill of Materials

Table 2 shows the EVM Bill of Materials.

Table 2. TMUXHS4212EVM BOM

Item	Quantity	Reference	Value	Manufacturer	Part Number	Footprint
1	1	C1	10uF	Murata	GRM188R61A106KE69D	603
2	1	C2	1uF	Taiyo Yuden	LMK107B7105KA-T	603
3	10	C3, C4, C5, C6, C9, C10, C11, C12, C13, C14	0.22uF	Taiyo Yuden	LMK063BJ224MP-F	201
4	1	C7	0.1uF	KEMET	C0402C104M8RACTU	402
5	1	C8	0.01uF	KEMET	C0402C103K8RACTU	402
6	16	J1, J2, J3, J4, J5, J6, J9, J10, J11, J12, J13, J14, J15, J16, J17, J18	SMP	Rosenberger	19S101-40ML5	CON_19 S101-40M_R04350
7	2	J7, J8	HDR3X1 M .1	Sullins	PEC03SAAN	HDR_THVT_1x3_100_M
8	1	LB1	PCB Label 0.650 ≈ x 0.200"W	Brady	THT-14-423-10	rectangle
9	1	PCB1	HSDC071	Any	HSDC071	n/a
10	2	P1, P2	Banana-Jack	Pomona	3267	bjack
11	6	R1, R2, R5, R8, R9, R10	0	Vishay Dale	CRCW02010000Z0ED	r0201
12	4	R3, R4, R6, R7	2k	Yageo	RC0402JR-072KL	r0402
13	4	SCRW1, SCRW2, SCRW3, SCRW4	NY PMS 440 005 PH	B&F Fastener	NY PMS 440 005 PH	screw
14	2	SHNT1, SHNT2	QPC02 SXGN-RC	Sullins	QPC02SXGN-RC	0.1
15	4	STDOFF1, STDOFF2, STDOFF3, STDOFF4	1902E	Keystone	1902E	Standoff
16	2	TP1, TP2	TESTPOINT	Keystone	5001	TP_THVT_5000-5004
17	1	U1	TMUXHS4212	Texas Instruments	TMUXHS4212IRKS	RKS0020BA_100x300

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