User's Guide

AXC-SMALLPKG1EVM Evaluation Module

ABSTRACT

This user's guide describes the characteristics, operation, and use of the AXC-SMALLPKG1EVM Evaluation Module (EVM). A complete printed-circuit board layout, schematic diagrams, and bill of materials are included in this document.

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1 Introduction

SN74AXCxxx devices are a new family of direction controlled level translators from Texas Instruments. AXC devices have dual-supply pins enabling configurable voltage translation from 0.65 V to 3.6 V and any intermediate voltage ranges. The AXC-SMALLPKG1EVM can be used to evaluate small package one, four and eight channel translator devices that are available in the AXC family. Refer to the competitive advantages of the AXC Family in the application report *Power sequencing for the AXC family of devices* (SCEA058). Watch Introduction to the AXC family of direction controlled translation device.

1.1 Features

The AXC family of direction controlled translation devices are dual-supply with configurable voltage translation and an operating range from 0.65 V to 3.6 V. The A port is designed to track V_{CCA}. V_{CCA} accepts any supply voltage from 0.65 V to 3.6 V. The B port is designed to track V_{CCB}. V_{CCB} accepts any supply voltage from 0.65 V to 3.60 V. This device is fully specified for partial-power-down applications using I_{OFF}. The I_{OFF} circuitry disables the outputs, thus preventing damaging current backflow through the device when it is powered down. The V_{CC} isolation feature ensures that if either V_{CC} input is at ground, both A and B data I/O ports are in the high-impedance state.

The eight channel SN74AXC8T245 device has two direction control pins, each controlling 4 data I/Os enabling independent and simultaneous up and down translation. The DIR1 pin controls the direction of data I/O channels 1 through 4, and the DIR2 pin controls the direction of data I/O channels 5 through 8. The functional table of the SN74AXC8T245 is listed in Table 1-1 and the SN74AXC1T45 is listed in Table 1-3. Refer to SN74AXC8T245EVM for testing SN74AXC8T245PW package.

This EVM is designed to support SN74AXC1T45 in DEA and the DTQ packages. There is an option of populating the SN74AXC8T245 in the RJW package and SN74AVC4T245 or the SN74AXC4T245 in the RSV package. It is also designed to support the bus-hold and -Q1 devices for the respective channel counts.

Table 1-1. Function: SN74AXC8T245

OE	DIR1	DIR2	Signal Direction
H	X	X	Hi-Z
L	L	L	B data to A bus
L	L	H	B{1:4} to A{1:4} and A{5:8} to B{5:8}
L	H	L	A data to B bus
L	H	H	A{1:4} to B{1:4} and B{5:8} to A{5:8}

Table 1-2. Function: SN74AXC4T245

$\overline{OE}$	DIR1	DIR2	Signal Direction
H	X	X	Hi-Z
L	L	L	B data to A bus
L	L	H	B{1:2} to A{1:2} and A{3:4} to B{3:4}
L	H	L	A{1:2} to B{1:2} and B{3:4} to A{3:4}
L	H	H	A data to B bus

Table 1-3. Function: SN74AXC1T45

DIR	Signal Direction
L	B data to A bus
H	A data to B bus

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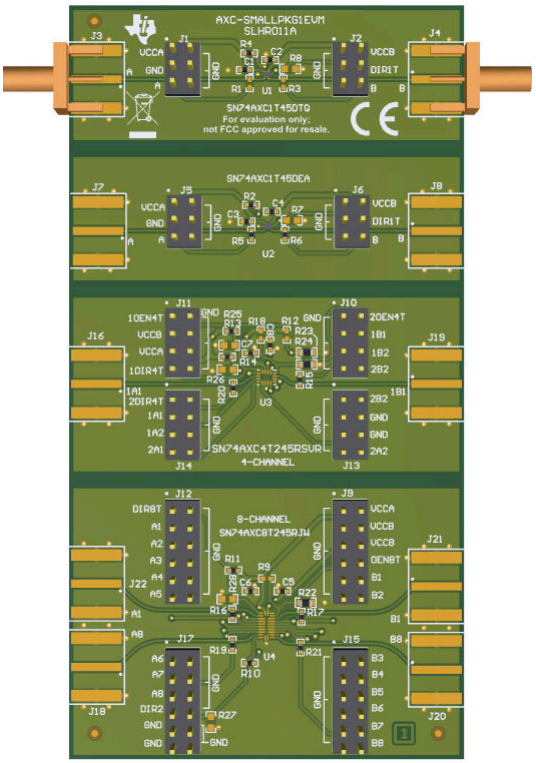


Figure 1-1. AXC-SMALLPKG1EVM: 8, 4, 2, 1 Channel versions

The supported packages are listed in Table 1-4.

Table 1-4. EVM Package Options

Version	Package	Device Populated
One Channel	DEA	Yes
One Channel	DTQ	Yes
Four Channel	RSV	No
Eight Channel	RJW	No

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1.2 Hardware Description

1.2.1 Headers

The EVM has standard 100-mil headers with the side closer to the device connected to ground. The side farther away from the device is mapped to the device pinout for easier connection as seen in Figure 1-1. The silkscreen indicates the pin function.

1.2.2 Bypass Capacitors

C1, C3, C6, and C7 are the bypass capacitors for V_{CCA} while C2, C4, C5, and C8 are the bypass capacitors for V_{CCB} with a value of 0.1 µF.

1.2.3 Pullup and Pulldown Resistors

The direction control and output enable pins are the inputs for the devices and should never be left floating. The CMOS inputs must be held at a known state, either V_{CC} or ground, to ensure proper device operation. Refer to *Implications of Slow or Floating CMOS Inputs* (SCBA004). The default state of the control input is referenced to V_{CCA} using a 10-kΩ pullup resistor. There is also the option of connecting the inputs to ground using pulldown resistors, or directly to ground via jumper on the header pins.

Table 1-5 lists the pullup and pulldown resistors.

Table 1-5. Pullup and Pulldown Resistors

Device	Pin	Pullup	Pulldown
One Channel DTQ	DIR	R4	R8
One Channel DEA	DIR	R2	R7
Four Channel RSV(1)	DIR1	R14	R25
	DIR2	R13	R26
	1OEN	R12	R23
	2OEN	R18	R24
Eight Channel RJW (2)	DIR1	R11	R28
	DIR2	R10	R27
	OEN	R9	R22

(1) Four channel considering SN74AVC4T245
(2) Eight channel considering SN74AXC8T245

1.2.4 SMB Connectors

The edge-mounted SMB connector option is provided for each of the channel versions on data I/O pins of A1 and B1, respectively, for high-speed operation. One pair of SMB connector is installed on the A and B data I/O pair of the SN74AXC1T45DTQ package while the corresponding header pin has an uninstalled R1 and R3 zero-ohm resistor.

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2 Board Layout

Figure 2-1 illustrates the AXC-SMALLPKG1EVM layout. Increase zoom level for clarity.

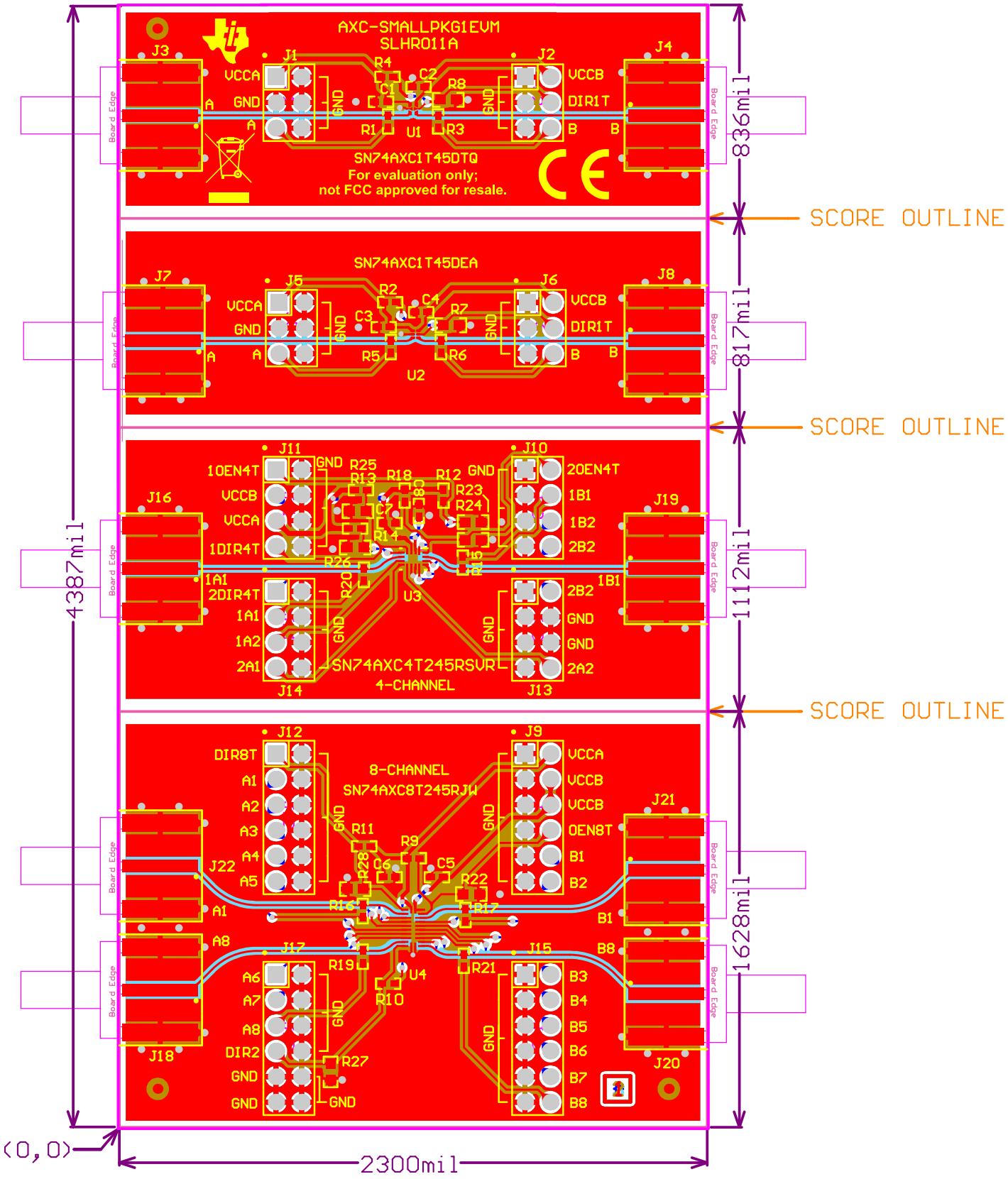


Figure 2-1. AXC-SMALLPKG1EVM Layout

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3 Schematic and Bill of Materials

3.1 Schematic

Figure 3-1 illustrates the AXC-SMALLPKG1EVM One channel DTQ schematic. Increase the zoom level for clarity.

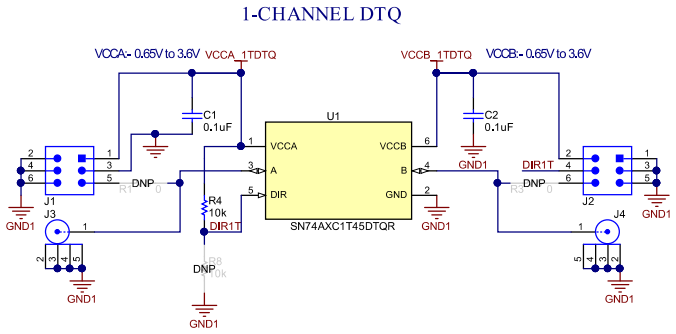


Figure 3-1. Schematic - One Channel DTQ

Figure 3-2 illustrates the AXC-SMALLPKG1EVM One channel DEA schematic

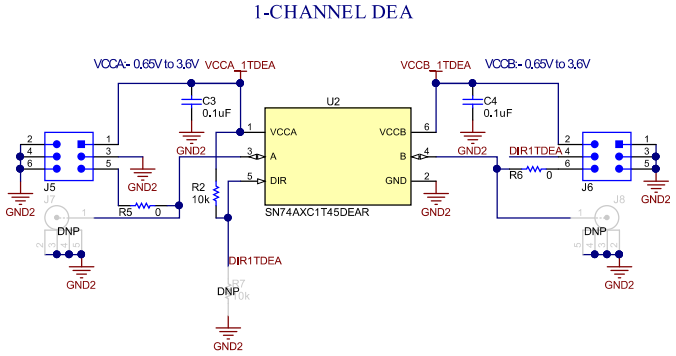


Figure 3-2. Schematic - One Channel DEA

Figure 3-3 illustrates the AXC-SMALLPKG1EVM Four channel RSV schematic

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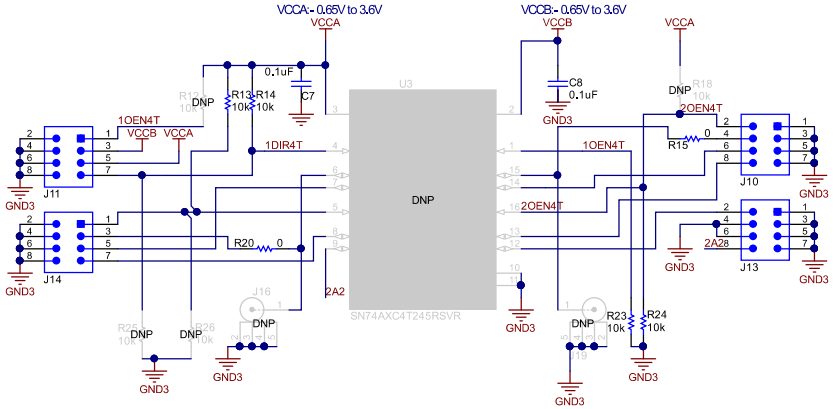


Figure 3-3. Schematic - Four Channel RSV

Figure 3-4 illustrates the AXC-SMALLPKG1EVM One channel DTQ schematic

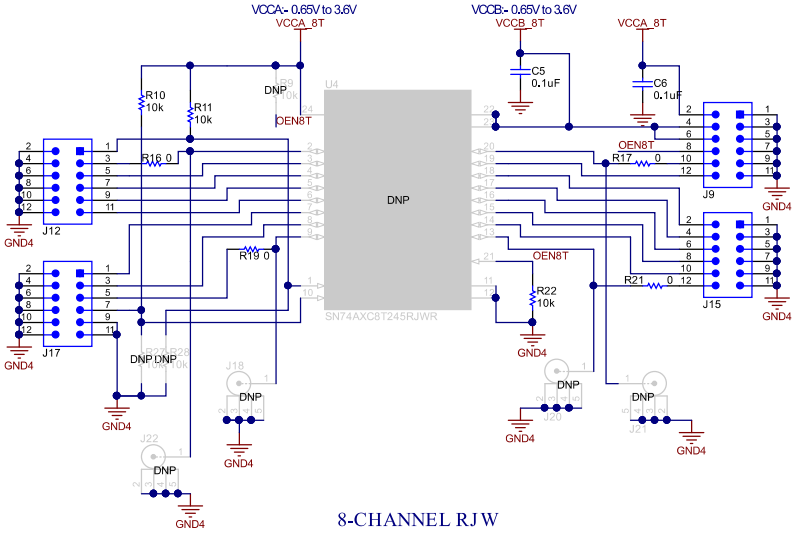


Figure 3-4. Schematic - Eight Channel RJW

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3.2 Bill of Materials

Table 3-1 lists the AXC-SMALLPKG1EVM bill of materials.

Table 3-1. AXC-SMALLPKG1EVM Bill of Materials

Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer
!PCB1	1		Printed Circuit Board		SLHR011	Any
C1, C2, C3, C4, C5, C6, C7, C8	8	0.1uF	CAP, CERM, 0.1 uF, 16 V, +/- 10%, X7R, 0402	0402	0402YC104KAT2A	AVX
J1, J2, J5, J6	4		Header, 100mil, 3x2, Gold, TH	3x2 Header	TSW-103-07-G-D	Samtec
J3, J4	2		Connector, SMB Jack, End launch, SMT	SMB End launch Jack, SMT	131-3701-801	Cinch Connectivity
J9, J12, J15, J17	4		Header, 100mil, 6x2, Gold, TH	6x2 Header	TSW-106-07-G-D	Samtec
J10, J11, J13, J14	4		Header, 100mil, 4x2, Gold, TH	4x2 Header	TSW-104-07-G-D	Samtec
R2, R4, R10, R11, R13, R14	6	10k	RES, 10 k, 5%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW040210K0JNED	Vishay-Dale
R5, R6, R15, R16, R17, R19, R20, R21	8	0	RES, 0, 5%, 0.063 W, 0402	0402	ERJ-2GE0R00X	Panasonic
R22, R23, R24	3	10k	RES, 10 k, 5%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	CRCW060310K0JNEA	Vishay-Dale
U1	1		Single-Bit Dual-Supply Bus Transceiver with Configurable Voltage-Level Shifting and 3-State Outputs, DTQ0006A (X2SON-6)	DTQ0006A	SN74AXC1T45DTQR	Texas Instruments
U2	1		Single-Bit Dual-Supply Bus Transceiver With Configurable Voltage Translation and Tri-State Outputs, DEA0006A (X2SON-6)	DEA0006A	SN74AXC1T45DEAR	Texas Instruments
FID1, FID2, FID3	0		Fiducial mark. There is nothing to buy or mount.	N/A	N/A	N/A
J7, J8, J16, J18, J19, J20, J21, J22	0		Connector, SMB Jack, End launch, SMT	SMB End launch Jack, SMT	131-3701-801	Cinch Connectivity
R1, R3	0	0	RES, 0, 5%, 0.063 W, 0402	0402	ERJ-2GE0R00X	Panasonic
R7, R8, R25, R26, R27, R28	0	10k	RES, 10 k, 5%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	CRCW060310K0JNEA	Vishay-Dale
R9, R12, R18	0	10k	RES, 10 k, 5%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW040210K0JNED	Vishay-Dale
U3	0		Quad-Bit Bus Transceiver with Configurable Voltage Translation and 3-State Outputs, RSV0016A (UQFN-16)	RSV0016A	SN74AXC4T245RSVR	Texas Instruments
U4	0		8-Bit Dual-Supply Bus Transceiver with Configurable Voltage Translation and 3-State Outputs, RJW0024A (UQFN-24)	RJW0024A	SN74AXC8T245RJWR	Texas Instruments

4 Revision History

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

Changes from Revision * (April 2018) to Revision A (July 2021)	Page
• Updated the numbering format for tables, figures and cross-references throughout the document	2

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