AMC1210EVM

Contents

1 EVM Overview

The AMC1210 modular evaluation module (EVM) provides four modulator channels from the ADS1204 for the AMC1210. Two are designated for resolver applications and two are designated for current measurements. All interface modes of the AMC1210 are provided.

The new modular EVM form factor allows for direct evaluation of the AMC1210's performance and operating characteristics. This EVM is compatible with the HPA-MCU Interface Board (SLAU106) from Texas Instruments.

- Four modulator channels provided by ADS1204
- All AMC1210 interface modes available
- Direct operation with a variety of DSK and microcontroller platforms from Texas Instruments
- All four ADS1204 channels have an input range of 0 V to 5 V.

1.1 Analog Interface

The AMC1210 modular EVM is designed for easy interfacing to resolvers and current sensors. Connector J05 is a 9-pole DSUB jack for easy connection to standard resolvers. To hold the floating resolver inputs to a predefined common mode level, a 2.5-V voltage is added on the resolver inputs.

Signal		Description
J05.1	IN1+	Positive sine wave input
J05.2	IN1–	Negative sine wave input
J05.3	IN2 +	Positive cosine wave input
J05.6	PWM1	Positive carrier wave output
J05.7	PWM2	Negative carrier wave output
J05.8	IN2–	Negative cosine wave input
Shield	PE	Cable shield

At the connectors J03 and J04, analog current sensor signals can be connected.

Signal		Description
J03.1, J04.1	IN3+, IN4+	Positive current input signal
J03.2, J04.2	PE	Cable shield
J03.3, J04.3	IN3–, IN4–	Negative current input signal

J07 is a dummy connector for mechanical stability purposes only.

The inputs of the ADS104 are secured against voltage peaks through clamp diodes.

1.2 Digital Interface

The AMC1210 modular EVM is designed for easy interfacing to multiple control platforms. Through the connectors J09 and J08, the AMC1210 can be configured through a SPI interface from a F2812 type DSK.

Signal		Description
J08.1	CLK	System clock
J08.2	SH2	Sample-and-hold signal 2
J08.7	SH1	Sample-and-hold signal 1
J09.3	SPICLK	SPI clock
J09.7	SPISTE	SPI frame sync
J09.11	SPIDIN	SPI input data
J09.13	SPIDOUT	SPI output data
J09.14	RST	Asynchronous reset input
J09.15	ACK	Data acknowledge output
J09.19	INT	Interrupt output

Through J08, J09, J10, and J11, the AMC1210 can be configured through one of three different multiplexed parallel interface modes.

Signal(1)		Description
J08.1	CLK	System clock
J08.2	SH2	Sample-and-hold signal 2
J08.7	SH1	Sample-and-hold signal 1
J09.14	RST	Asynchronous reset input
J10.1	CS	Chip select
J10.3	WR	Write signal
J10.5	RD	Read signal
J11.1	AD0	Address/databus bit 0 (LSB)
J11.3	AD1	Address/databus bit 1
J11.5	AD2	Address/databus bit 2
J11.7	AD3	Address/databus bit 3
J11.9	AD4	Address/databus bit 4
J11.11	AD5	Address/databus bit 5
J11.13	AD6	Address/databus bit 6
J11.15	AD7	Address/databus bit 7 (MSB)
J09.15	ACK	Data acknowledge output
J09.17	ALE	Address latch enable
J09.19	INT	Interrupt output

(1) All even pin numbers of the connectors J10, J11, J12, and J15 are grounded.

All digital signals can be accessed through the connectors J12, J13, J14, and J15 on the top of the AMC1210 modular EVM. The different signals are placed at the same position as the bottom-mounted connectors, see the preceding tables.

For higher frequencies on the CLK input of the AMC1210, it could be possible to reduce the value of the series resistor R47.

1.3 Power Supply

The AMC1210 modular EVM requires two supply voltages and two optional supply voltages. A 5-Vdc voltage is needed for the ADS1204 and the core of the AMC1210. A variable supply in the range of 2.7 Vdc to 5 Vdc is needed for the interface pins of the AMC1210. In addition, a ±15-V supply is necessary if the PWM driver operational amplifier OPA1632 is used. If the AMC1210 modular EVM is used in combination with the HPA-MCU Interface Board, J06 provides connection to the common power bus described in the document SLAU106.

When used as a stand-alone EVM, the power supplies can be applied to J01 and J02. While filters are provided for all four power supplies, optimal performance of the EVM requires a clean, well-regulated power source.

2 EVM Operation

To configure a desired interface mode of the AMC1210 the jumpers JP09, JP10, and JP16 are used.

Jumper			Description
JP09	**JP10**	**JP16**	
Open	Open	Open	SPI interface mode
Open	Closed	Closed	Parallel interface mode 1
Closed	Open	Closed	Parallel interface mode 2
Closed	Closed	Closed	Parallel interface mode 3 (Factory default condition)

The jumpers JP01, JP06, and JP11 determine the clocking scheme of the ADS1204.

Jumper			Description
JP01	**JP06**	**JP11**	
1-2 Closed	Open	Open	The ADS1204 gets the clock from AMC1210 pin CLK4.
2-3 Closed	Open	Closed	The ADS1204 gets the system clock. (Factory default condition)
2-3 Closed	Closed	Open	The ADS1204 works with its internal clock.

The jumpers JP07 and JP08 choose the driver of the PWM output pins for the resolver carrier signal.

Jumper	Description
JP07, JP08	
1-2 Closed	The PWM signal is driven directly from the AMC1210.
2-3 Closed	The PWM signal is driven by the operational amplifier OPA1632. (Factory default condition)

The AMC1210 can drive up to 100 mA directly from the pins PWM1 and PWM2. The purpose of the operational amplifier OPA1632 is for the ability of filtering the carrier signal and still be capable of driving 85 mA. If the OPA1632 operational amplifier is not used, the ±15-V supply can be left unconnected. In this case, it is recommenced to remove the resistors R24 and R26 to prevent latchup effects in the operational amplifier and nonlinearities on the PWM outputs.

The jumpers JP02, JP03, JP04, and JP05 determine if the current sensor signals will be buffered or connected directly to the ADS1204 inputs.

Jumper		Description
JP02, JP03, JP04, JP05	**JP12, JP13, JP14, JP15**	
1-2 Closed	Closed	The current sensor signal is buffered. (Factory default condition)
2-3 Closed	Open	The current sensor signal is unbuffered.

The ADS1204 has a reference input pin for each channel and a reference output pin. This reference input pin normally is direct connected to the 2.5-V reference output pin through a buffer and a RC-low-pass filter. If the input signal span is from either the resolver or the current sensor, a resistive divider can be added to reduce the reference voltage at the input pin. The resistor R53 has to be soldered in to reduce the reference voltage for the resolver channels. The resistor R55 has to be soldered in to reduce the reference voltage for the current sensor channels.

3 AMC1210 Modular EVM Bill of Materials

The following table contains a complete bill of materials for the AMC1210EVM.

Designators	Description	Manufacturer	Mfg. Part Number
C01, C14, C16, C25, C034	10 µF, size A, tantalum, 16 V, 10%	Kemet	T491A106K016AS
C02, C04, C06, C08, C09, C15, C17, C18, C20, C22, C26–30, C35, C36, C44 C45	100 nF, 0805, ceramic, 50 V, 10%, X7R	TDK	C0805C104K5RAC
C10–C13	22 pF, 0805, ceramic, 50 V, 10%, COG	TDK	C0805C220K5GAC
C19, C21	10 µF, size C, tantalum, 20 V, 10%	Kemet	T491C106K020AS
C23, C24	1000 pF, 0805, ceramic, 50 V, 10%, X7R	TDK	C0805C102K5RAC
C31–C33, C43	33 µF, size D, tantalum, 16 V, 10%	Kemet	T491D336K016AS
C37–C42	1 µF, 0805, ceramic, 16 V, 10%, X7R	TDK	C0805C105K4RAC
D01	Zener diode, 7.5 V, 1.3 W	Fairchild	BZX85C7V5
D02,D03	Zener diode, 18 V, 1.3 W	Fairchild	BZX85C18
D04–D09, D15, D16	Small signal diodes, SOT23	Fairchild	BAV99
D10–D13	LED, SMT 1206, Green	Kingbright	KPTD-3216CGCK
D14	Zener diode, 5.1 V, 1.3 W	Fairchild	BZX85C_5V1
F1-F4 (Optional - not installed on production EVMs)	Filter, EMI suppression, 0.5 MHz-1 GHz, 50 VDC, 10AM	Murata	BNX002-01
J01-J04	3 Terminal screw connector	OST	ED1515
J05	DB9, RTANG RECPT 0.318 W/ STD HDWR	Assmann	ADF09LLF
J06 (bottom side)	5 pin, dual row, SMT socket	Samtec	SSW-105-F-D-VS-K
J07–J10 (bottom side)	10 pin, dual row, SMT socket	Samtec	SSW-110-F-D-VS-K
J11(bottom side)	16 pin, dual row, SMT socket	Samtec	SSW-116-F-D-VS-K
J12(top side)	16 pin, dual row, SMT header	Samtec	TSM-116-01-T-DV
J13-J15(top side)	10 pin, dual row, SMT header	Samtec	TSM-110-01-T-DV
JP01–JP05, JP07, JP08	3 Pin header	Samtec	TSW-103-07-L-S
JP06, JP09–JP16	2 Pin header	Samtec	TSW-102-07-L-S
R01, R04, R05, R08, R13, R16, R19, R22, R58, R59, R60–R65	10.0 Ω, 0805, 0.100 W, 1%	Vishay/Dale	CRCW080510R0F
R02, R03, R06, R07	4.99 kΩ, 0805, 0.10 W, 1%	Vishay/Dale	CRCW08054991F
R11, R12, R14, R15, R17, R18, R20, R21, R24, R26, R52, R54	2.0 kΩ, 0805, 0.100 W, 1%	Vishay/Dale	CRCW08052001F
R23, R28, R29, R51, R56, R74	10.0 kΩ, 0805, 0.100 W, 1%	Vishay/Dale	CRCW08051002F
R25,R27	2.49 kΩ, 0805, 0.100 W, 1%	Vishay/Dale	CRCW08052491F
R30–R39	200 Ω, 0805, 0.100 W, 1%	Vishay/Dale	CRCW08052000F
R40–R46, R48, R72, R73	1.0 kΩ, 0805, 0.100 W, 1%	Vishay/Dale	CRCW08051001F
R47	511 Ω, 0805, 0.100 W, 1%	Vishay/Dale	CRCW08055110F
R53, R55	Not installed		
R57, R70, R71	100 kΩ, 0805, 0.100 W, 1%	Vishay/Dale	CRCW08051003F
R66, R67	1.50 kΩ, 1206, 0.125 W, 1%	Vishay/Dale	CRCW12061501F
R68	332 Ω, 1206, 0.125 W, 1%	Vishay/Dale	CRCW12063320F

Designators	Description	Manufacturer	Mfg. Part Number
R69	511 Ω, 1206, 0.125 W, 1%	Vishay/Dale	CRCW12065110F
U01	AMC1210	Texas Instruments	AMC1210RHA
U02	ADS1204	Texas Instruments	ADS1204I
U03	OPA4354	Texas Instruments	OPA4354U
U04	OPA2347	Texas Instruments	OPA2347UA
U05-U07	SN74LVC2G157	Texas Instruments	SN74LVC2G157DCT
U08	OPA1632	Texas Instruments	OPA1632UA

3.1 AMC1210 Modular EVM Schematic

The schematic diagram is shown on the following page.

REVISIONS			
REV	DATE	DCR #	DESCRIPTION

CAD ORIGINAL ON VBDC

CONTRACT NO.		TEXAS INSTRUMENTS TUCSON CORP. P.O. BOX 11400-TUCSON, ARIZONA 85734
APPROVALS	DATE	
DRAWN Juergen Lipps	13-Sep-05	EVM_AMC1210 Evaluationboard
CHECKED Frank Ohnhauser	13-Sep-05	
ISSUED		SIZE F / CAGE CODE 13919 / DWG. NO. / REV V1.0
		SCALE: / SHEET

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EVM WARNINGS AND RESTRICTIONS

It is important to operate this EVM within the input voltage range of +15 V to -15 V and the output voltage range of 0 V to 5 V.

Exceeding the specified input range may cause unexpected operation and/or irreversible damage to the EVM. If there are questions concerning the input range, please contact a TI field representative prior to connecting the input power.

Applying loads outside of the specified output range may result in unintended operation and/or possible permanent damage to the EVM. Please consult the EVM User's Guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative.

During normal operation, some circuit components may have case temperatures greater than 30°C. The EVM is designed to operate properly with certain components above 60°C as long as the input and output ranges are maintained. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors. These types of devices can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during operation, please be aware that these devices may be very warm to the touch.

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