

Evaluation Board for FSK **AD5700/AD5700-1** HART Modem

FEATURES

Convenient connections for power through screw

Terminal block

Use of on-chip RC oscillator or an external crystal

Various link options

EQUIPMENT NEEDED

Host controller with UART interface

GENERAL DESCRIPTION

This user guide describes the evaluation board for the **AD5700/AD5700-1** Highway Addressable Remote Transducer (HART®) modem. This board can be used to evaluate either the **AD5700** or the **AD5700-1** part. Both can operate from a single 1.71 V to 5.5 V supply, with the AD5700-1 having the added feature of an integrated oscillator.

Complete specifications for both products can be found in the **AD5700/AD5700-1** data sheet available from Analog Devices, Inc., which should be consulted in conjunction with this user guide when using the evaluation board.

EVALUATION BOARD

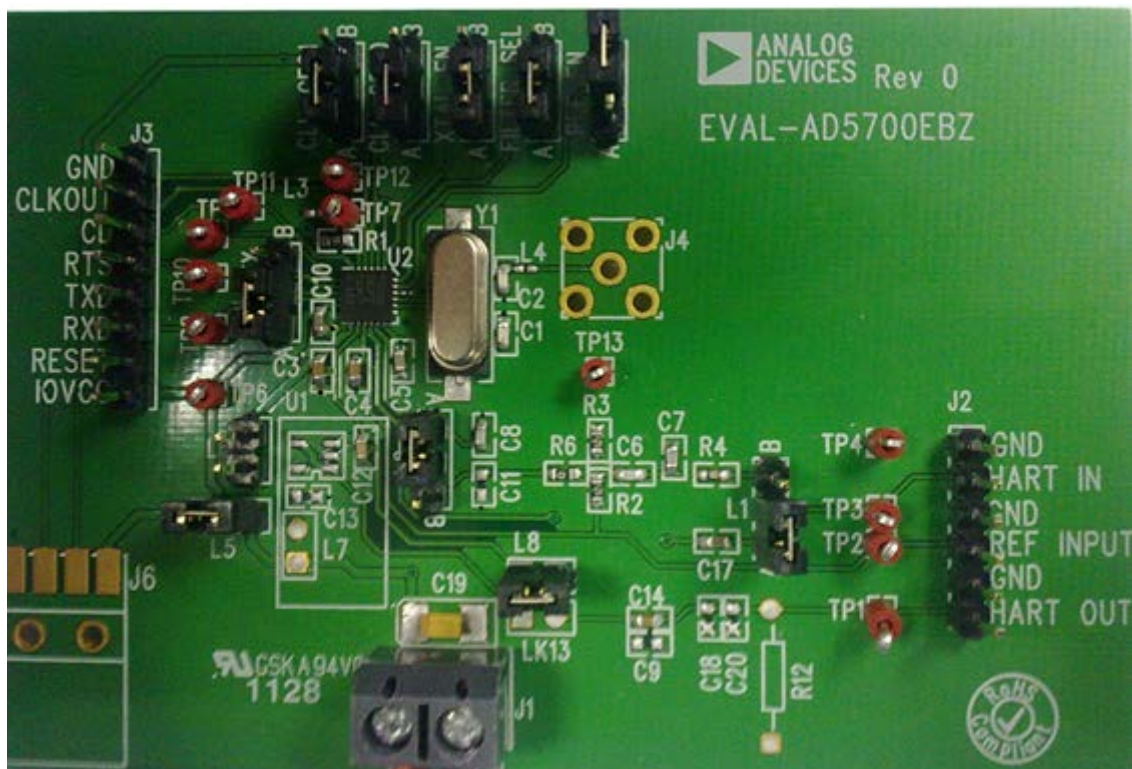


Figure 1.

10665-001

TABLE OF CONTENTS

Features	1	Power Supplies.....	3
Equipment Needed.....	1	Link Options	3
General Description	1	Evaluation Board Schematics and Artwork.....	4
Evaluation Board	1	Ordering Information.....	7
Revision History	2	Bill of Materials.....	7
Evaluation Board Hardware	3		

REVISION HISTORY

5/13—Rev. 0 to Rev. A	
Changed Supply Min from 2 V to 1.71 V	1
2/12—Revision 0: Initial Version	

EVALUATION BOARD HARDWARE

POWER SUPPLIES

AGND and DGND are connected together on the board to provide a single GND signal. To power the [EVAL-AD5700-1EBZ](#), supply 3.3 V between the V_{CC} and GND inputs for the analog supply of the [AD5700/AD5700-1](#). With L5 inserted (default), this also provides power to IOV_{CC} .

LINK OPTIONS

A number of links on the evaluation board must be set for the required operating setup before using the board. The functions of these link options are described in detail in Table 2. The default setup is using the on-chip reference, the crystal oscillator, and the internal receive filter (see Table 1).

Table 1. Default Link Options

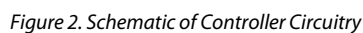
Link No.	Option
CLK_CFG1	A
CLK_CFG0	A
XTAL_EN	A
FILTER_SEL	B
L1	A
L2	A
REF_EN	B
DUPLEX	A
L5	Inserted
L6	Not inserted
L8	Inserted

Table 2. Link Functions

Table 2. Link Functions

Link No.	Function																																													
CLK_CFG1, CLK_CFG0, XTAL_EN	<p>The AD5700/AD5700-1 support numerous clocking configurations to allow a simple, low cost solution. The AD5700/AD5700-1 can use an external crystal or ceramic resonator, a CMOS input, or an internal RC oscillator (AD5700-1 only). The CLK_CFG0, CLK_CFG1, and XTAL_EN links configure the clock generation as follows:</p> <table><tr><th>XTAL_EN</th><th>CLK_CFG1</th><th>CLK_CFG0</th><th>CLKOUT</th><th>Description</th></tr><tr><td>B</td><td>A</td><td>A</td><td>No output</td><td>3.6864 MHz CMOS clock connected at XTAL1 pin</td></tr><tr><td>B</td><td>A</td><td>B</td><td>No output</td><td>1.2288 MHz CMOS clock connected at XTAL1 pin</td></tr><tr><td>B</td><td>B</td><td>A</td><td>No output</td><td>Internal oscillator enabled</td></tr><tr><td>B</td><td>B</td><td>B</td><td>1.2288 MHz output</td><td>Internal oscillator enabled, CLKOUT enabled</td></tr><tr><td>A</td><td>A</td><td>A</td><td>No output</td><td>Crystal oscillator enabled</td></tr><tr><td>A</td><td>A</td><td>B</td><td>3.6864 MHz output</td><td>Crystal oscillator enabled, CLKOUT enabled</td></tr><tr><td>A</td><td>B</td><td>A</td><td>1.8432 MHz output</td><td>Crystal oscillator enabled, CLKOUT enabled</td></tr><tr><td>A</td><td>B</td><td>B</td><td>1.2288 MHz output</td><td>Crystal oscillator enabled, CLKOUT enabled</td></tr></table>	XTAL_EN	CLK_CFG1	CLK_CFG0	CLKOUT	Description	B	A	A	No output	3.6864 MHz CMOS clock connected at XTAL1 pin	B	A	B	No output	1.2288 MHz CMOS clock connected at XTAL1 pin	B	B	A	No output	Internal oscillator enabled	B	B	B	1.2288 MHz output	Internal oscillator enabled, CLKOUT enabled	A	A	A	No output	Crystal oscillator enabled	A	A	B	3.6864 MHz output	Crystal oscillator enabled, CLKOUT enabled	A	B	A	1.8432 MHz output	Crystal oscillator enabled, CLKOUT enabled	A	B	B	1.2288 MHz output	Crystal oscillator enabled, CLKOUT enabled
XTAL_EN	CLK_CFG1	CLK_CFG0	CLKOUT	Description																																										
B	A	A	No output	3.6864 MHz CMOS clock connected at XTAL1 pin																																										
B	A	B	No output	1.2288 MHz CMOS clock connected at XTAL1 pin																																										
B	B	A	No output	Internal oscillator enabled																																										
B	B	B	1.2288 MHz output	Internal oscillator enabled, CLKOUT enabled																																										
A	A	A	No output	Crystal oscillator enabled																																										
A	A	B	3.6864 MHz output	Crystal oscillator enabled, CLKOUT enabled																																										
A	B	A	1.8432 MHz output	Crystal oscillator enabled, CLKOUT enabled																																										
A	B	B	1.2288 MHz output	Crystal oscillator enabled, CLKOUT enabled																																										
FILTER_SEL, L1, L2	<p>These link options set whether the internal or external receive band-pass filter is used at the HART input. Setting FILTER_SEL to Position B and L1 and L2 to Position A sets the board to use the internal receive band-pass filter. Setting FILTER_SEL to Position A and L1 and L2 to Position B sets the board to use the external receive band-pass filter.</p>																																													
REF_EN	<p>This sets whether the internal or an external reference is used.</p> <p>Position A—disables the internal reference, and a buffered external 2.5 V reference source must be applied at REF.</p> <p>Position B—enables the internal 1.5 V reference and buffer.</p>																																													
DUPLEX	<p>Allows the modulator and demodulator of the AD5700/AD5700-1 to be enabled at the same time.</p> <p>Position A—the AD5700/AD5700-1 operate in half-duplex operation (controlled by \overline{RTS}).</p> <p>Position B—the AD5700/AD5700-1 operate in full duplex operation, with the modulator and demodulator of the AD5700/AD5700-1 enabled at the same time.</p>																																													
L5	<p>Allows V_{CC} to be connected directly to IOV_{CC}.</p> <p>Inserted—V_{CC} is connected to IOV_{CC}.</p> <p>Not inserted—V_{CC} is disconnected from IOV_{CC}.</p>																																													
L6	Do not insert this link.																																													
L8	This link must be inserted.																																													

10565-002



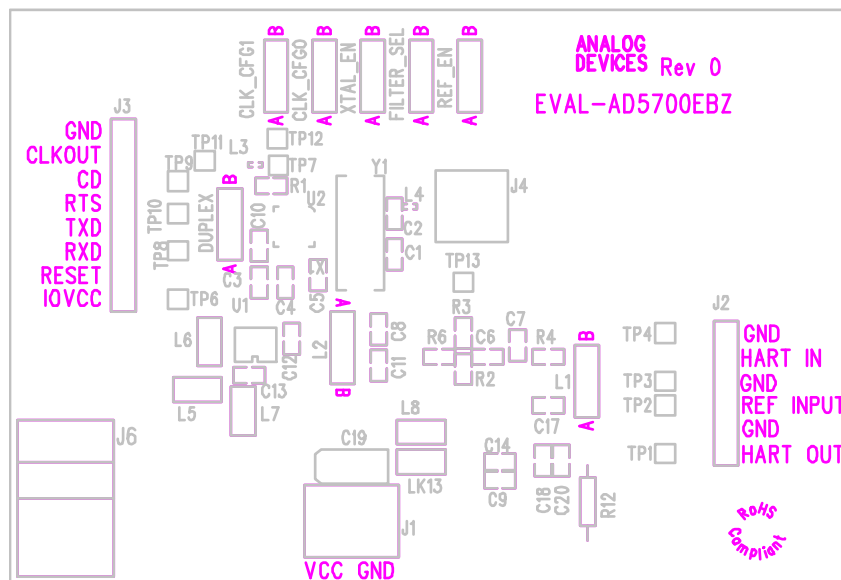


Figure 3. Component Placement Drawing

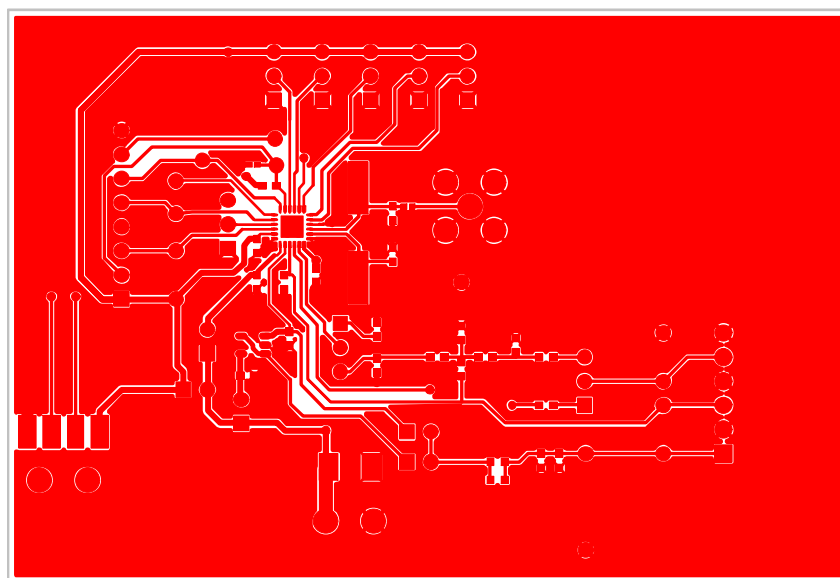
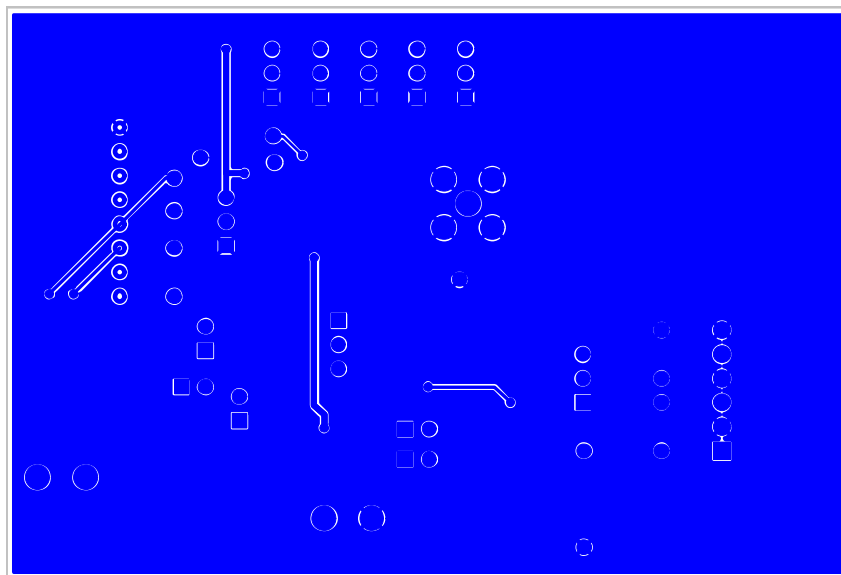


Figure 4. Component Side PCB Drawing



10565-005

Figure 5. Solder Side PCB Drawing

ORDERING INFORMATION

BILL OF MATERIALS

Table 3.

Quantity	Reference Designator	Description	Part Number	Supplier/Number
1	U2	HART modem	AD5700-1BCPZ	Analog Devices
2	C1, C2	36 pF, C0G capacitor (0603)	C0603C360J5GACTU	FEC 1865478
2	C3, C4	1 μ F, X7R capacitor (0603)	C0603C105K4RACTU	FEC 1828826
2	C5, C10	100 nF, X7R capacitor (0603)	MCCA000159	FEC 1759016
1	C6	300 pF, C0G capacitor (0603)	GRM1885C1H301JA01D	Digi-Key 490-1438-1-ND
1	C7	150 pF, C0G capacitor (0603)	06031A151JAT2A	FEC 1740606
1	C8	680 pF, C0G capacitor (0603)	MCCA000221	FEC 1759084
1	C12	22 nF, X7R capacitor (0603)	06035C223KAT2A	FEC 1658869
1	C14	2.2 μ F, X7R capacitor (0603)	GRM188R71A225KE15D	FEC 1797012
1	C17	2.2 nF, C0G capacitor (0603)	C0603C222J5GACTU	FEC 1535565
1	C19	10 μ F, tantalum capacitor (Case A)	TCJA106M010R0300	FEC 1135234
10	CLK_CFG0, CLK_CFG1, DUPLEX, FILTER_SEL, REF_EN, XTAL_EN, J2, J3, L1, L2	Headers	M20-9990345	FEC 1022248
1	J1	2-pin terminal block	CTB5000/2	FEC 151789
3	L5, L6, L8	2-pin (0.1" pitch) header and shorting shunt	M20-9990246	FEC 1022247
1	R1	1 M Ω (0603)	MC 0.063W 0603 5% 1M	FEC 9331727
2	R2, R3	1.2 M Ω (0603)	RC0603FR-071M2L	FEC 9238859
1	R4	150 k Ω (0603)	MC 0.063W 0603 1% 150K	FEC 9330623
1	R6	0 Ω (0603)	CRCW06030000Z0EA	FEC 1469739
13	TP1 to TP13	Test point	20-313137	FEC 8731144
1	Y1	Quartz crystal SMD	ABLS-3.6864MHZ-L4Q-T	Digi-Key 535-9893-1-ND

NOTES

**ESD Caution**

ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

Legal Terms and Conditions

By using the evaluation board discussed herein (together with any tools, components documentation or support materials, the "Evaluation Board"), you are agreeing to be bound by the terms and conditions set forth below ("Agreement") unless you have purchased the Evaluation Board, in which case the Analog Devices Standard Terms and Conditions of Sale shall govern. Do not use the Evaluation Board until you have read and agreed to the Agreement. Your use of the Evaluation Board shall signify your acceptance of the Agreement. This Agreement is made by and between you ("Customer") and Analog Devices, Inc. ("ADI"), with its principal place of business at One Technology Way, Norwood, MA 02062, USA. Subject to the terms and conditions of the Agreement, ADI hereby grants to Customer a free, limited, personal, temporary, non-exclusive, non-sublicensable, non-transferable license to use the Evaluation Board FOR EVALUATION PURPOSES ONLY. Customer understands and agrees that the Evaluation Board is provided for the sole and exclusive purpose referenced above, and agrees not to use the Evaluation Board for any other purpose. Furthermore, the license granted is expressly made subject to the following additional limitations: Customer shall not (i) rent, lease, display, sell, transfer, assign, sublicense, or distribute the Evaluation Board; and (ii) permit any Third Party to access the Evaluation Board. As used herein, the term "Third Party" includes any entity other than ADI, Customer, their employees, affiliates and in-house consultants. The Evaluation Board is NOT sold to Customer; all rights not expressly granted herein, including ownership of the Evaluation Board, are reserved by ADI. **CONFIDENTIALITY.** This Agreement and the Evaluation Board shall all be considered the confidential and proprietary information of ADI. Customer may not disclose or transfer any portion of the Evaluation Board to any other party for any reason. Upon discontinuation of use of the Evaluation Board or termination of this Agreement, Customer agrees to promptly return the Evaluation Board to ADI. **ADDITIONAL RESTRICTIONS.** Customer may not disassemble, decompile or reverse engineer chips on the Evaluation Board. Customer shall inform ADI of any occurred damages or any modifications or alterations it makes to the Evaluation Board, including but not limited to soldering or any other activity that affects the material content of the Evaluation Board. Modifications to the Evaluation Board must comply with applicable law, including but not limited to the RoHS Directive. **TERMINATION.** ADI may terminate this Agreement at any time upon giving written notice to Customer. Customer agrees to return to ADI the Evaluation Board at that time. **LIMITATION OF LIABILITY.** THE EVALUATION BOARD PROVIDED HEREUNDER IS PROVIDED "AS IS" AND ADI MAKES NO WARRANTIES OR REPRESENTATIONS OF ANY KIND WITH RESPECT TO IT. ADI SPECIFICALLY DISCLAIMS ANY REPRESENTATIONS, ENDORSEMENTS, GUARANTEES, OR WARRANTIES, EXPRESS OR IMPLIED, RELATED TO THE EVALUATION BOARD INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTY OF MERCHANTABILITY, TITLE, FITNESS FOR A PARTICULAR PURPOSE OR NONINFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS. IN NO EVENT WILL ADI AND ITS LICENSORS BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES RESULTING FROM CUSTOMER'S POSSESSION OR USE OF THE EVALUATION BOARD, INCLUDING BUT NOT LIMITED TO LOST PROFITS, DELAY COSTS, LABOR COSTS OR LOSS OF GOODWILL. ADI'S TOTAL LIABILITY FROM ANY AND ALL CAUSES SHALL BE LIMITED TO THE AMOUNT OF ONE HUNDRED US DOLLARS (\$100.00). **EXPORT.** Customer agrees that it will not directly or indirectly export the Evaluation Board to another country, and that it will comply with all applicable United States federal laws and regulations relating to exports. **GOVERNING LAW.** This Agreement shall be governed by and construed in accordance with the substantive laws of the Commonwealth of Massachusetts (excluding conflict of law rules). Any legal action regarding this Agreement will be heard in the state or federal courts having jurisdiction in Suffolk County, Massachusetts, and Customer hereby submits to the personal jurisdiction and venue of such courts. The United Nations Convention on Contracts for the International Sale of Goods shall not apply to this Agreement and is expressly disclaimed.