

Evaluating the *iCoupler* **ADuM3480/ADuM3481/ADuM3482** Quad-Channel Digital Isolators

FEATURES

- Access to all 4 data channels
- Multiple connection options
- Support for Tektronix active probes
- Provision for cable terminations
- Support for PCB edge-mounted coaxial connectors
- Easy configuration
- Installed *iCoupler* digital isolator: **ADuM3481**

SUPPORTED *iCoupler* MODELS

- [ADuM3480](#)
- [ADuM3481](#)
- [ADuM3482](#)

GENERAL DESCRIPTION

The **EVAL-ADuM3481EBZ** supports the **ADuM3480/ADuM3481/ADuM3482**, which are 3750 V isolation rating, 4-channel *iCoupler*® isolators. The evaluation board provides a JEDEC standard 20-lead SSOP pad layout, support for signal fanout, and loopback as well as optimal bypass capacitance. Signals can be wired onto the board as well as brought onto the board through edge-mounted SMA connectors (sold separately) or terminal blocks for power connections. The board includes 200 mil header positions for compatibility with Tektronix active probes.

The board follows best printed circuit board (PCB) design practices for 4-layer boards, including a full power and ground plane on each side of the isolation barrier. No other EMI or noise mitigation design features are included on this board. In cases of very high speed operation or when ultralow emissions are required, refer to the **AN-1109** application note for additional board layout techniques.

PHOTOGRAPH OF THE EVALUATION BOARD

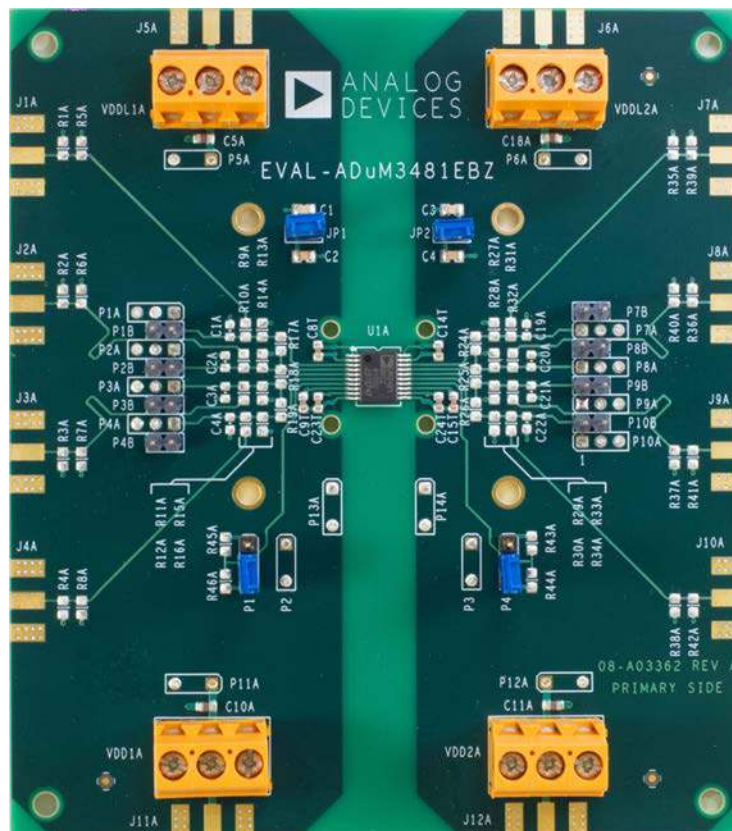


Figure 1. **EVAL-ADuM3481EBZ** Evaluation Board

TABLE OF CONTENTS

Features	1	Connectors	3
Supported iCoupler Models	1	Power Input	3
General Description	1	Data I/O Structures	4
Photograph of the Evaluation Board.....	1	Bypass on the PCB	4
Revision History	2	High Voltage Capability	4
Evaluation Board Circuitry	3	Evaluation Board Schematics and Artwork	5
PCB Evaluation Goals.....	3	Bill of Materials.....	7

REVISION HISTORY

10/13—Revision 0: Initial Version

EVALUATION BOARD CIRCUITRY

PCB EVALUATION GOALS

The [EVAL-ADuM3481EBZ](#) board is intended to achieve the following goals:

- Evaluate the full range of *iCoupler* data transfer functions
- Power each side of the *iCoupler* isolator independently
- Allow high differential voltage to be applied between the two sides of the *iCoupler* isolator
- Allow connecting easily to power and instrumentation

Although the evaluation board comes with the [ADuM3481](#) *iCoupler* digital isolator installed, the board is also compatible with the [ADuM3480](#) and [ADuM3482](#), and the user can substitute either of these components in place of the [ADuM3481](#).

CONNECTORS

The PCB provides support for three types of interconnections:

- SMA edge-mounted connectors
- Through-hole signal ground pairs
- Terminal blocks for power connections

With these three options, both temporary and permanent connections to the board can easily be made.

When coaxial connections are desired, SMA connector positions are available for V_{DD1} , V_{DDL1} , V_{DD2} , and V_{DDL2} power supplies, as well as all digital inputs and outputs. These SMA connector positions are left unpopulated so that the user can customize the connectors for a given application. Figure 2 shows examples of installed SMA connectors; these connectors were chosen because they are not only low profile and provide excellent mechanical connections to the PCB but also support 50 Ω coaxial cabling. Because most lab equipment is compatible with BNC connectors, adaptors may be required to use some on-board connectors.

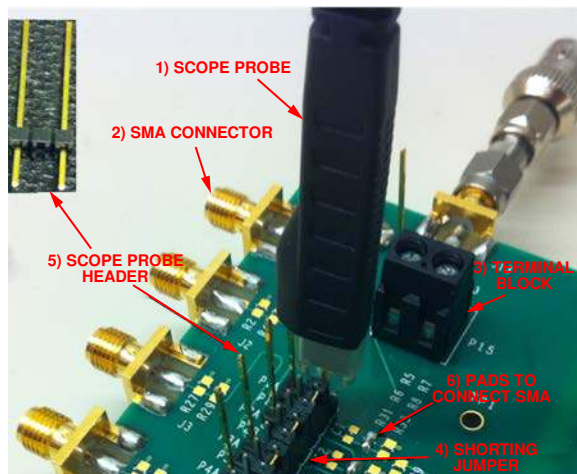


Figure 2. Optional Components

Power can be connected through the V_{DDL1A} , V_{DD1A} , V_{DDL2A} , and V_{DD2A} terminal blocks, or can be wired directly to the PCB via the P5A, P6A, P11A, and P12A through-hole connectors. Each through-hole pair provides a power ground pair with the power on the Pin 1 hole. The pin spacing of each through-hole connector is 200 mil between centers. This matches the pin spacing required for Tektronix active scope probes. If a scope probe connection is desired, the header shown in Figure 2 can be soldered into the through-hole positions, and the signal pin can be trimmed to match the height requirements of a Tektronix active scope probe.

POWER INPUT

Each side of the [ADuM3480/ADuM3481/ADuM3482](#) *iCoupler* isolator may require two off-board power sources. The power supplies for each side of the isolator can be common or independent, depending on the requirements of the application. Refer to the [ADuM3480/ADuM3481/ADuM3482](#) data sheet for proper voltage ranges and combinations. To support all possible power configurations, two power inputs are provided on each side of the part—one input for V_{DD} and one for V_{DDL} . Because V_{DD} and V_{DDL} are often connected together so that a single power supply can be used, the [ADuM3480/ADuM3481/ADuM3482](#) also provide a jumper position to allow these inputs to be connected together on the PCB through JP1 and JP2—one connection for each side of the board. If independent power supplies are to be used for V_{DD} and V_{DDL} , remove the corresponding jumper so that the power supply inputs are not connected together and apply power to both of the power inputs.

Sharing a single supply and ground for both sides of the part (across the isolation barrier) does not harm the isolator, and is useful for functional testing of the [ADuM3480/ADuM3481/ADuM3482](#) *iCoupler* isolator when common-mode voltages are not present. If common-mode voltage are to be applied across the isolation barrier, independent power supplies must be provided for each side of the isolator.

A ground and two power planes are present on Layer 2 and Layer 3 of the PCB on each side of the isolation barrier.

DATA I/O STRUCTURES

Each data channel has a variety of structures to help configure, load, and monitor both the input and output. Figure 3 shows one of the datapaths from an external connection to the DUT pin. Each channel has similar connections.

Starting at the external connection, the signal path is

1. A pad layout for a PCB board edge-mounted SMA connector.
2. Two 0805 pads are provided where 100 Ω resistors to ground can be installed. The combined resistance is 50 Ω to provide a termination for a standard coaxial cable.
3. A standard 0805 pad layout that allows the coaxial and termination structures to be connected to the rest of the signal path.
4. A 0605 pad layout between the signal path and V_{DDx} can be used for installing a pull-up resistor.
5. A populated 2-pin header provides a signal ground pair that can be used for clip leads or for shorting a channel to ground temporarily.
6. There is a grouping of three open through holes, consisting of a signal and two ground connections. This can be used for hardwiring signal wires into the PCB, installing a header to accept a Tektronix active probe, or installing a 2-pin header to allow adjacent channels to temporarily be shorted together.
7. A 0805 pad layout between the signal and ground where a load capacitor or resistor can be installed.
8. Pads to the adjacent channels are provided to allow permanent connection of adjacent channels. Inputs can be fanned out to several channels, or inputs and outputs can be connected together to allow signals to loopback.

Figure 2 shows many of the optional components installed, as well as how jumpers can be used to temporarily connect channels. This figure shows a signal connected to the first channel SMA and then fanned out to the top three channels and monitored by an active scope probe.

BYPASS ON THE PCB

Several positions and structures are provided to allow optimum bypass of the evaluation board. Provision has been made for optional surface-mount bulk capacitors to be installed near the power connectors to compensate for long cables to the power supply. Parallel bypass capacitors are installed near the [ADuM3481](#) and consist of a 0.1 μF capacitor for each V_{DDx} , V_{DDCx} , and V_{DDLx} on the top side and a 0.1 μF capacitor for each V_{DDx} , V_{DDCx} , and V_{DDLx} on the bottom side of the board. It is best to use the top side bypass positions if possible.

The PCB also implements a distributed capacitive bypass on the PCB. This consists of power and ground planes closely spaced on the inner layers of the PCB. This minimizes noise and the transmission of EMI without using complex design features.

HIGH VOLTAGE CAPABILITY

This PCB is designed in adherence with 2500 V basic insulation practices. High voltage testing beyond 2500 V is not recommended. Appropriate care must be taken when using this evaluation board at high voltages, and the PCB should not be relied on for safety functions because it has not been high potential tested (also known as hipot tested or dielectric withstanding voltage tested) or certified for safety.

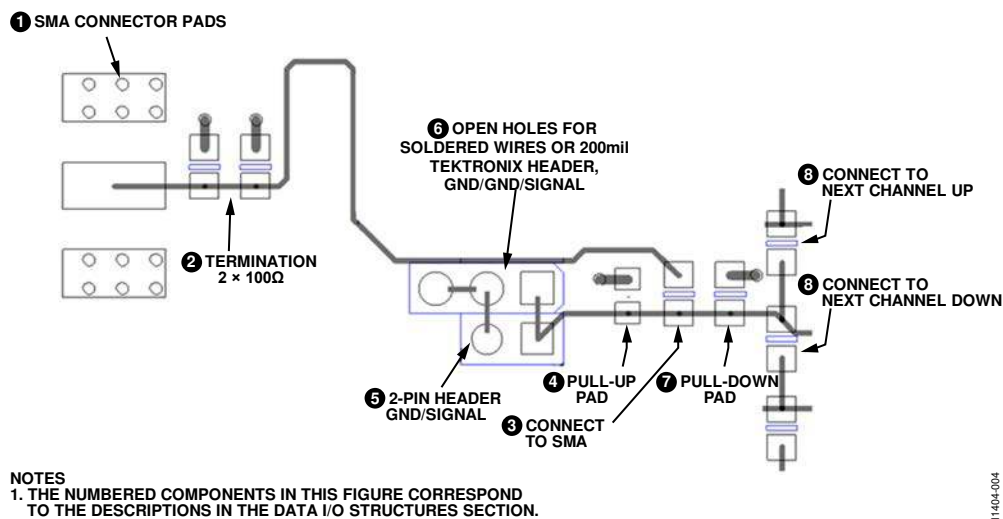


Figure 3. Configuration and Monitoring Structures (Showing a Datapath from an External Connection to the DUT Pin)

EVALUATION BOARD SCHEMATICS AND ARTWORK

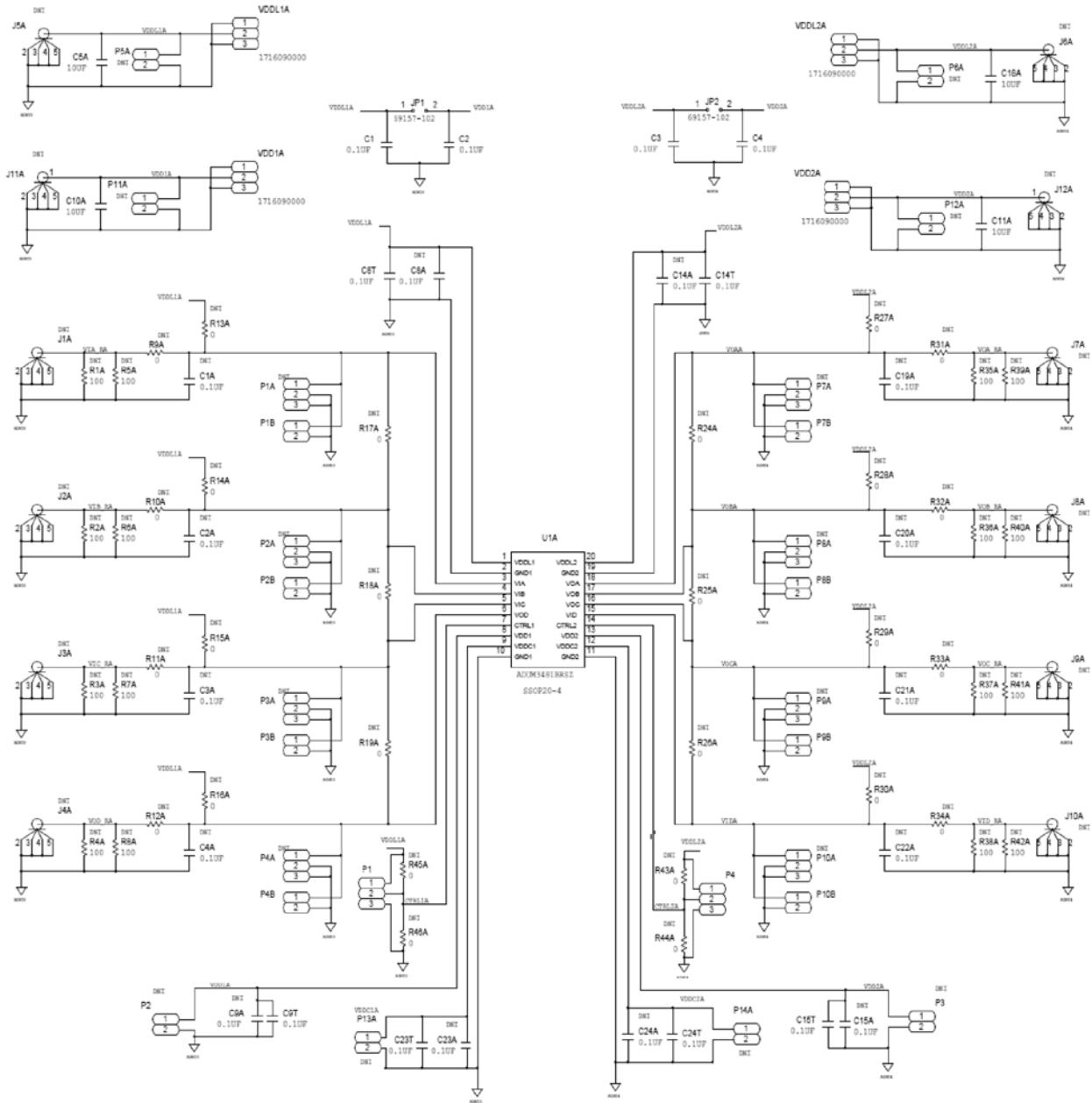


Figure 4. EVAL-ADuM3481EBZ Schematic

11404-003

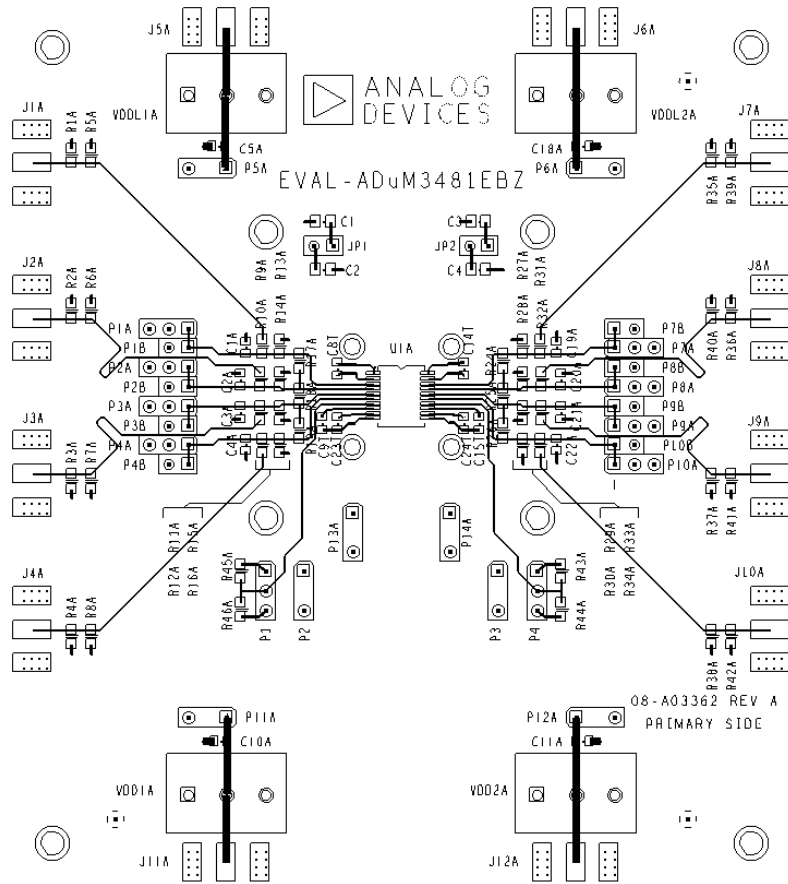


Figure 5. Top Side Layout

11404-005

BILL OF MATERIALS

Table 1. Bill of Materials

Qty	Reference Designator	Description	Part Number ¹
1	U1	DUT	Analog Devices, Inc., ADuM3481
14	C1, C2, C3, C4, C5A, C8T, C9T, C10, C11, C14T, C15T, C18A, C23T, C24T	0.1 μ F, 25 V, 10%, 0805	DNI
46	R1A to R46A	0805 pad for optional, application-specific connections	DNI
6	C1A to C4A, C19A, C22A	0603 pad for optional, application-specific connections	DNI
4	VDDL1A, VDDL2A, VDD1A, VDD2A	Terminal block	Weidmüller 1716090000
14	P2, P3, P13, P14, P1A to P10A	2-pin header, 200 mil spacing (not installed)	Samtec MTSW-202-12-G-S-730
10	JP1, JP2, P1B to P4B, P7B to P10B	2-pin header 100 mil spacing	Samtec HTSW-102-07-T-S
12	J1A to J12A	SMA edge connector (not installed)	Johnson/Emerson Network Power Connectivity Solutions, Inc., 142-0701-851

¹ DNI = do not install.

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 NON-INFRINGEMENT 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.