APPLICATION NOTE

ISG-AN-01

ISG3300 EVAL BOARD USER GUIDE MANUAL Version 1.05

INTRODUCTION

The ISG3300 EVAL Board is a fully implemented physical layer circuit board used for cable modem applications. It contains the ISG3300 cable transceiver, connectors to evaluate the RF characteristics of the transceiver, modulator and demodulator chips, ESD protection on the supply lines, and requires one dual power supply.

CONNECTIONS

The supply voltages required are 5 and 24 Volts DC. Apply 5 V with Digital Ground to the Power Header (see Diagram 2a). Apply 24 V with Analog Ground to the next pins. Each supply's negative terminal (analog and digital ground) should be connected together at the power supply and not on the board. The parallel port on PC1 connects to the dB 25 connector (refer to Diagrams 1 & 3). Lastly, the I^2C interface board connects to PC2's parallel port and its I^2C socket connects to the I^2C header on the *ISG3300 EVAL Board* (refer to Diagram 3 or 4). In cases where the *ISG3300 EVAL Board* has a 18X1 connector (see Diagram 2a), the user is advised to plug the ISG3300 into the header before turning on the power supplies. Note that pins 1 and 18 are filled and keyed to minimize misalignments.

Note:
1. The I^2C board is not included. It may be ordered from Broadcom.

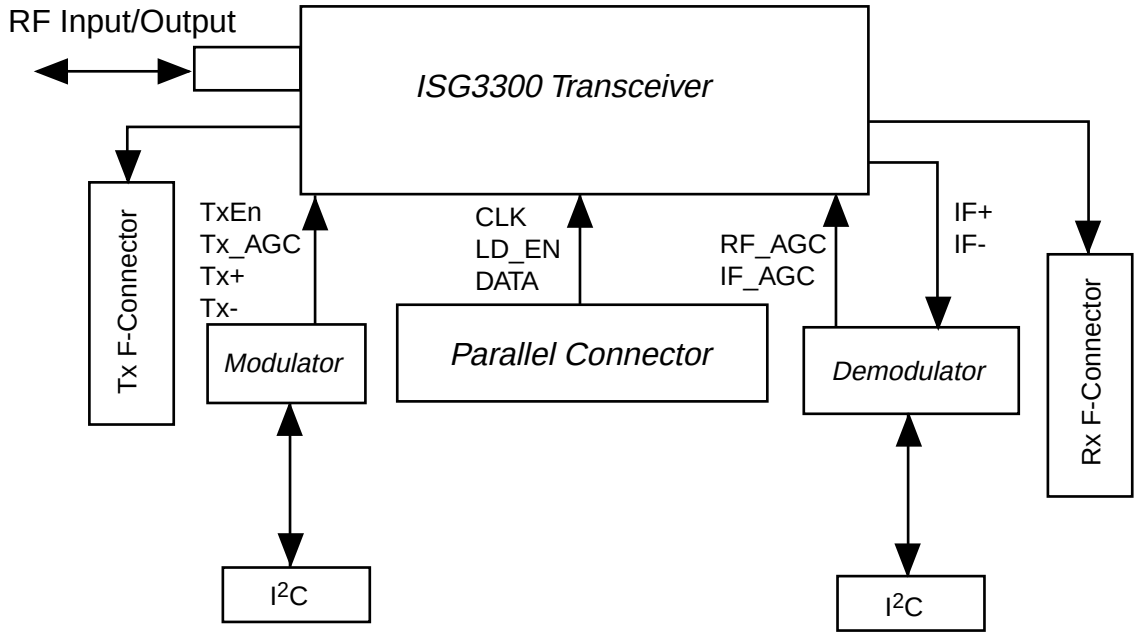


Diagram 1: Block Diagram of ISG3300 Eval Board.

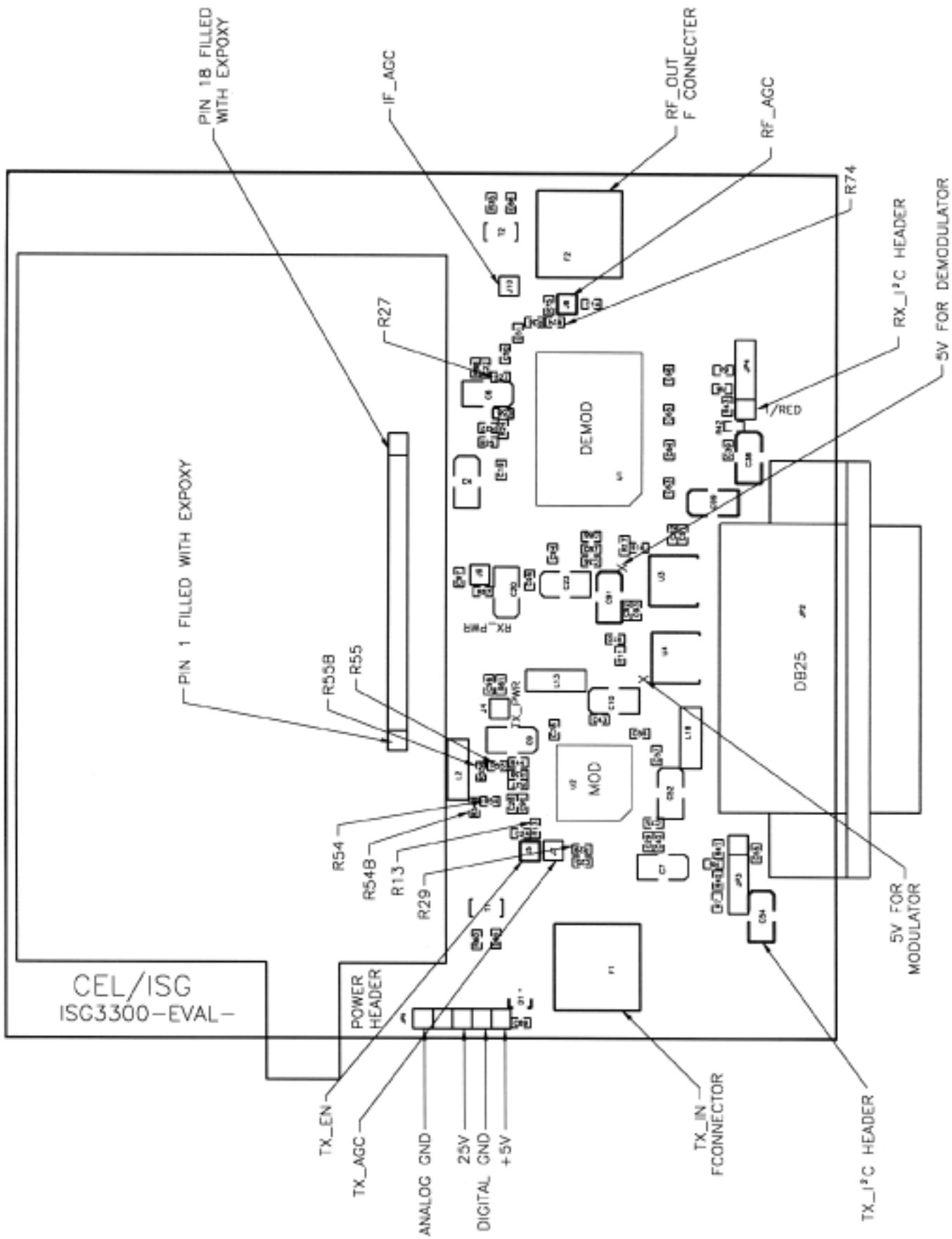


Diagram 2a: Top side of EVAL Board.

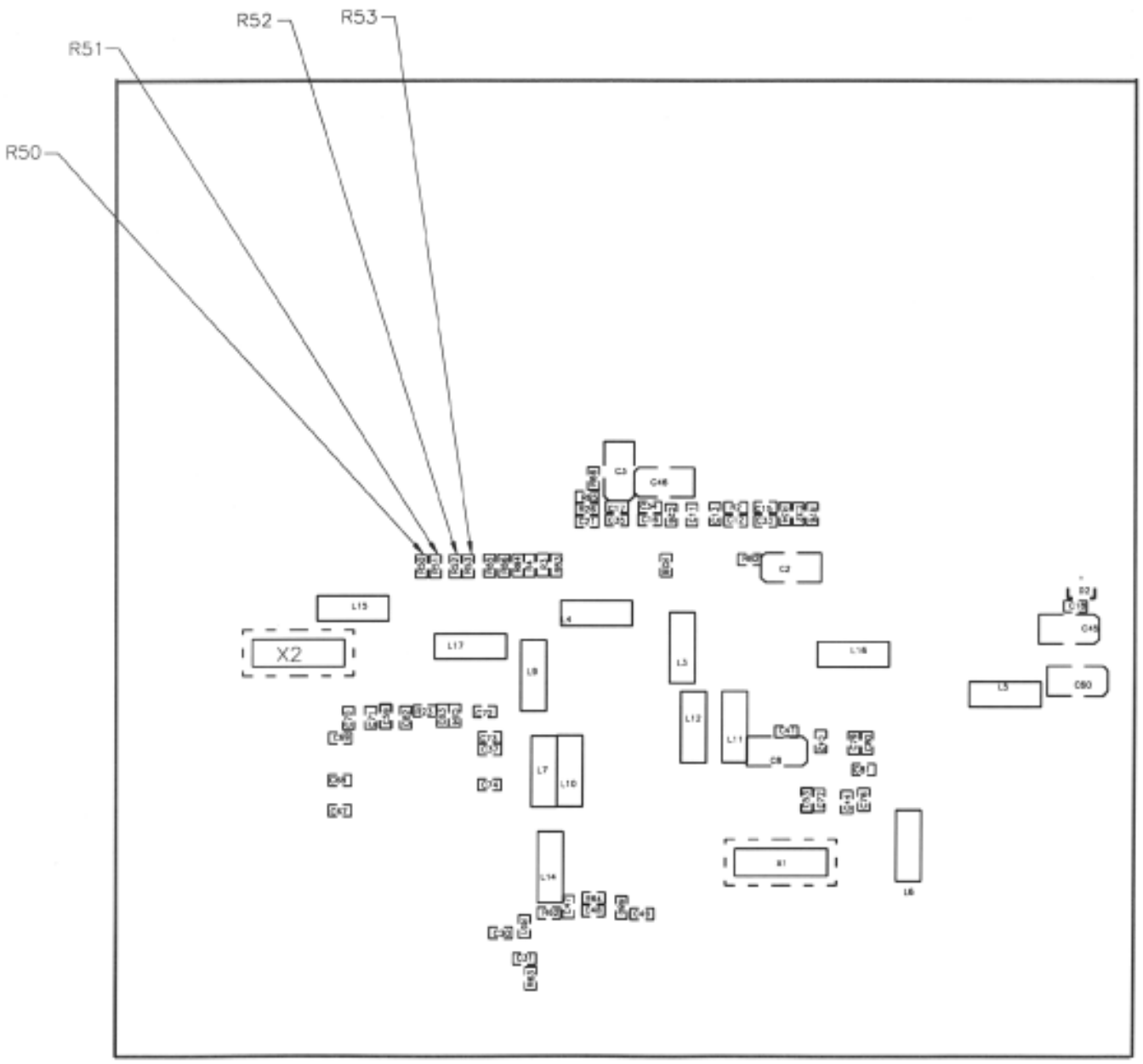


Diagram 2b: Underside of EVAL Board.

Modulator:

The Broadcom BCM3037 I²C lines are connected at the bottom left 4-pin Tx header (see Diagram 2). This chip feeds a modulated QPSK/16-QAM signal and TX_AGC into the ISG3300. Apply 5 volts at the "5 V for Modulator" post (see diagram 2a) before running the software.

Demodulator:

The bottom right 4-pin RX header (see Diagram 2) provides I²C lines to the BCM3116. This chip controls the two AGC lines on the receiver and demodulates recovered 5.75 MHz at QAM-64 or QAM-256 signals. Apply 5 volts at the "5 V for Demodulator" post (see diagram 2a) before running the software.

Bypassing Mod/Demod Chips

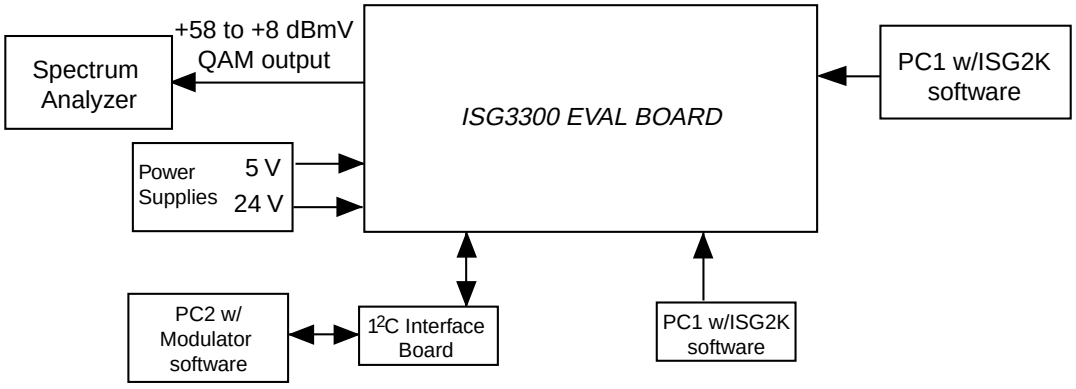
To observe the RF characteristics of the ISG3300 EVAL Board, a few modifications are required. Refer to Diagrams 2a and 2b for locations.

Applying external Tx Frequency

1. Remove R54 and R55.
2. Place R54B and R55B with 0-Ohm resistors.
3. Feed signal into Tx_In F-Connector.

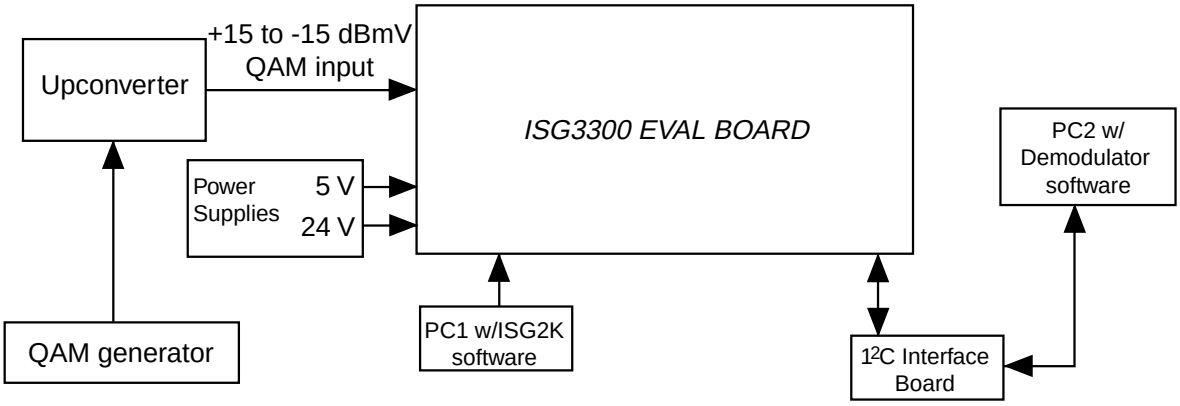
Applying external TX_AGC

1. Remove R29.
2. Apply desired voltage at Tx _AGC (do not exceed 3.3 volts).
3. Remove R13.
4. Apply 3.3 volts at Tx_EN to turn on the TX circuitry.



* Eval board to be powered on before starting modulator software.

Diagram 3: Test Setup for Transmitter Evaluation



* Eval board to be powered on before starting modulator software.

Diagram 4: Test Setup for Receiver Evaluation

Applying External Rx AGCs

1. Remove R27 and R74.
3. Apply desired voltage to IF_AGC (do not exceed 3.3 volts).
4. Apply desired voltage to RF_AGC (do not exceed 3.3 volts).

Viewing Recovered 5.75 MHz IF_output.

1. Remove R51 and R53 (see Diagram 2b, underside).
2. Apply R50 and R52 with 0-Ohm resistors.
3. Connector Rx_Out F-connector to spectrum analyzer to view output.

BROADCOM SOFTWARE

Whether the ISG3300 EVAL BOARD is modulating or demodulating data, both cases require the board to be powered ON before starting the Broadcom programs. For further detail regarding the Broadcom software, refer to their *Technical Information for BCM93160/BCM93037.*

BCM93037.exe

The program will send commands to the 3037 to generate the desired QAM output for the return path. The software also allows the user to modify such parameters as Tx Freq, symbol rate, and power output (from the chip and from the ISG3300 transmitter).

The following steps will get the user started to generate a QAM signal.

1. Run the BCM3037.exe executable program.
2. Upon initialization, the main menu for the UPSTRM Controller will appear. (If "*Failed to Communicate w/ BCM3037*" appears, check that header is connected correctly or check that X1 crystal is operating).
3. The lower right-hand corner gives status of connection to BCM3037. It should read *I2C_COM_OK (I2C_NOACK* indicates broken connection).
4. Hit F1: Run Command file
5. A list of files will appear.
6. Select QPSK and hit <ENTER>.
7. The main menu screen re-appears. The right hand side shows the 3037 should be transmitting a 2.56MHz symbol rate, QPSK signal, centered at 15MHz.

Modifications to QAM Signal

At the Main Menu, hit F3: Transmit Control Screen to give the transmitter status. It is the screen that allows the user to modify parameters like frequency, symbol rate, amplitude level from the modulator (int power level), and TX_AGC (ext power level).

BCM93160.exe (or BCM93180.exe)

This program sends commands to the BCM3116 (BCM3118) demodulator chip to recover QAM64 or QAM256 data. It has options to observe characteristics such as constellations, S/N ratio, and pre/post BER. The program is set up to receive QAM64 with 5 MHz symbol rate, and **Digicipher II™** FEC mode (BCM93180.exe needs **DVB** FEC mode).

The following steps will get the user started in recovering a QAM64 signal:

1. Run the BCM93160.exe (BCM93180.exe) executable program.
2. The main menu for QAMLink Controller will appear.
3. It should show Error Stat: *NO ERROR* to confirm the connection is good to the BCM3116. (*I2C_NOACK* will appear if there are problems).
4. If communication is good, but the QAM is: *Out of Lock,* then hit F1: Reacquire QAM Channel. The QAM is: *In Lock* will appear if data is recovered.
5. Depending on input RF levels, the SNR Est: is typically 30 to 36 dB.

To view constellation, follow the following steps:

1. Hit F8: Monitor Constellation.
2. The screen shows a constellation on the left and bit-error-rate (BER), SNR statistics on the right.
3. On occasions, jumping into the constellation screen causes the 3116 to loose track of the QAM. Press F9: Require to recover the signal.

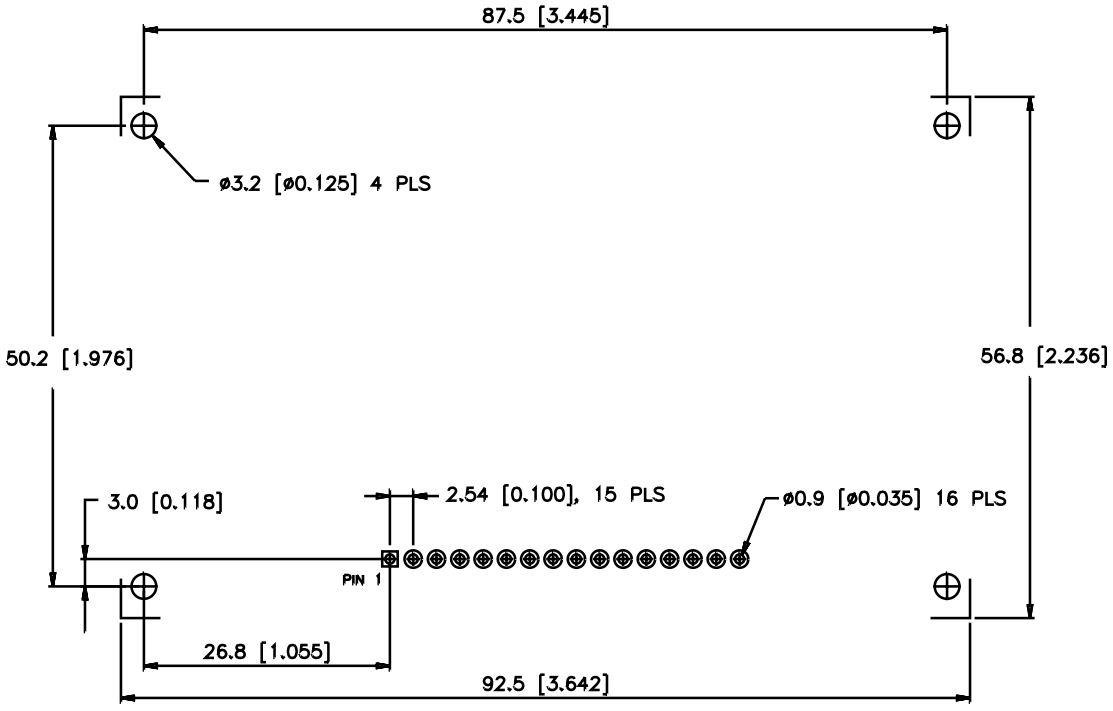
To change to QAM 256 or Symbol Rate:

1. Hit F3: Select Acq Script.
2. Find the "256" Script.
3. Enter "1" for # *of Attempts*.
4. Enter "1000" for *Wait Time*.
5. Press <Enter> a few times to return to the Main Menu.
6. Hit F4: Set Symbol Rate.
7. Enter the symbol rate as displayed on QAM Generator.

ISG SOFTWARE (Channel Selection)

ISG has a software interface program, *ISG2000 Demonstration Program*, that will program both necessary VCOs frequencies on the ISG3300 to recover the desired input channel.

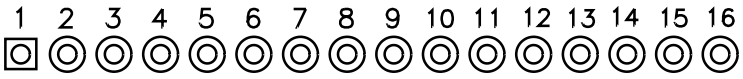
1. Run the ISG2K_12B.exe executable program.
2. A Windows-based user interface will appear.
3. Select the desire receiver channel in the R.F. Freq. box. If the frequency is not there, select a smaller Step Size, and select Increment or Decrement.
4. Press Reload to send commands to ISG3300. After the initial Reload, selecting Increment or Decrement (in units selected in Step Size box) will change the LOs to receive the next channels.



RECOMMENDED PAD LAYOUT

MODEL: ISG20XXX

UNIT OF MEASURE
MM[INCHES]



1: RFAGC	5: TXIN−	9: IFAGC	13: LE
2: VCC (Tx)	6: TXAGC	10: GND	14: GND
3: TXEN	7: VCC2(Rx)	11: CK	15: IFOUT−
4: TXIN+	8: VCC1(Rx)	12: DATA	16: IFOUT+

Diagram 5: Recommended Pad Layout

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