TERIDIAN SEMICONDUCTOR CORP.

Simplifying System Integration™

73M1966B
Evaluation Kit User Manual

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1 Introduction

The 73M1966B Evaluation Kit is a system for 73M1966B customer evaluations. The system is primarily designed to be used with a standard PCM channel measuring set, such as the Wandel & Goltermann PCM-4, but can be used as a stand-alone evaluation platform. The kit contains the 73M1966 Demo Motherboard, the 73M1966B Demo Board, and the Teridian Graphical User Interface (GUI). The recommended Wandel & Goltermann PCM-4 test set is an automated system that can analyze the performance of the 73M1966B. The GUI can be used to configure the 73M1966B control registers using a personal computer and to read its status conditions.

The kit demonstrates functionality and allows evaluation of the 73M1966B performance characteristics via the PCM channel measuring set, which provides a source of A-law or μ-law data that is used for the analysis of the bi-directional channel.

Figure 1 shows the 73M1966B Demo Board connected on top of the Motherboard. The Motherboard provides user-friendly connections to the PCM-4 test set, the DC Loop Supply and the personal computer running the GUI software.

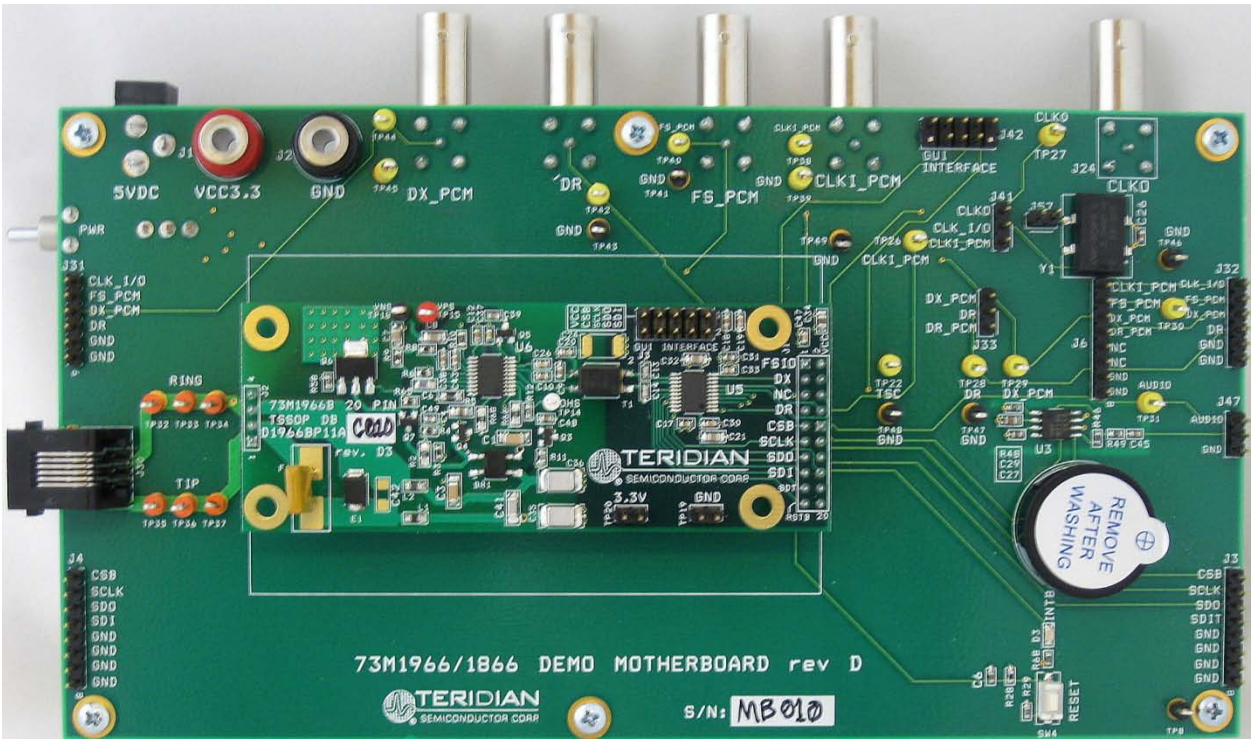

Figure 1: Motherboard with 73M1966B Demo Board

Use this document with those listed in Related Documentation. Note that this document does not describe the setup and configuration of the 73M1966B Demo Board; refer to the *73M1966B Demo Board User Manual*. The Teridian Graphical User Interface is described in the *73M1866B/73M1966B GUI User Guide*.

1.1 System Requirements

- A PC running Microsoft® Windows® XP, ME or 2000 equipped with a parallel port (LPT).
- A standard PCM channel measuring set, such as the Wandel & Goltermann PCM-4.
- One megabyte of disk storage for the GUI software.

1.2 Package Contents

The 73M1966B Evaluation Kit includes:

- A 73M1966 Demo Motherboard (Rev. D).
- 73M1966B Demo Board (D1966P11A, Rev. D3)
- A GUI parallel interface cable.
- An AC to DC transformer wall plug.
- A CD containing the GUI software and the documentation files.

1.3 Safety and ESD Notes

Connecting live voltages to the Demo Board system will result in potentially hazardous voltages on the boards.

Extreme caution should be taken when handling the Demo Boards after connection to live voltages!

The Demo Boards are ESD sensitive! ESD precautions should be taken when handling these boards!

2 Getting Started

This section describes the steps needed to ensure proper connection of the components, as follows:

- Connecting to the PCM Test Set.
- Connecting the SPI to the PC.
- Connecting to a Central Office Line Simulator.
- Installing the Graphical User Interface.
- Connecting the Power Supply
- Applying Power.

Figure 2 shows the basic connections of the 73M1966 Demo Motherboard and external equipment.

Be sure to connect the test set equipment and telephone network simulator before powering up the board.

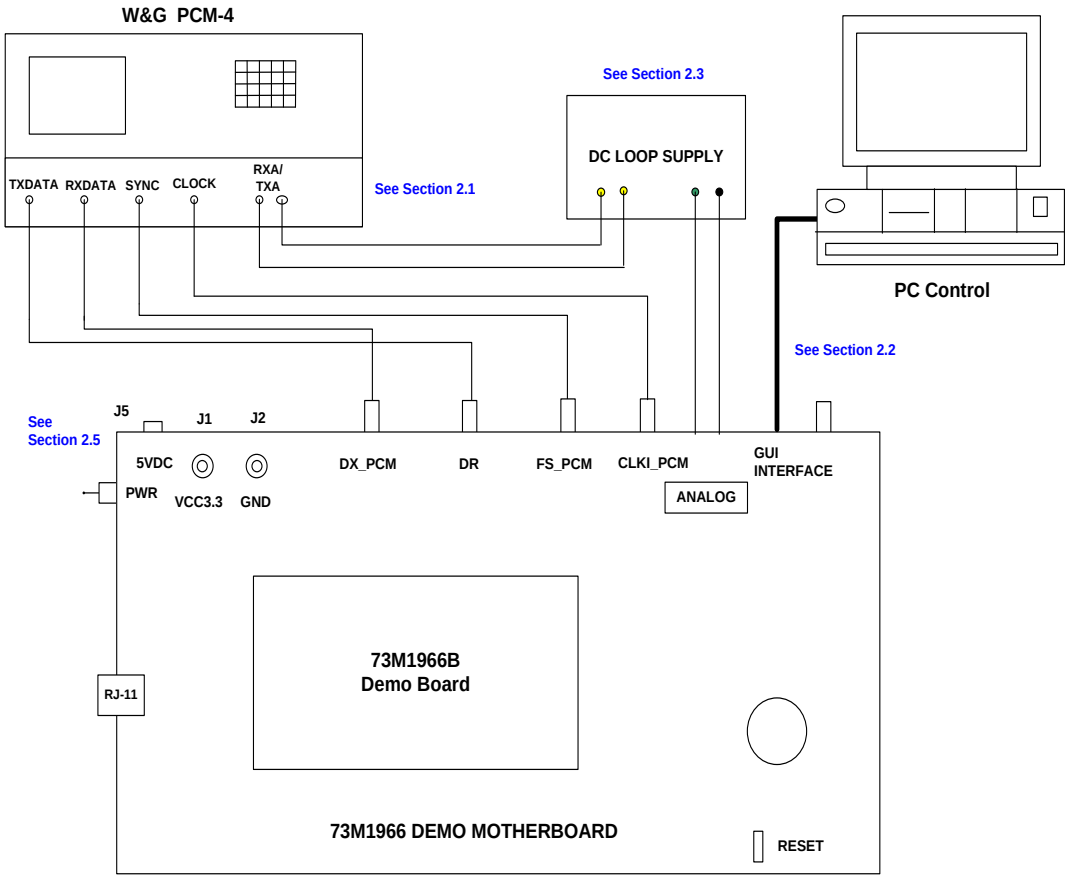

Figure 2: Demo Board Connections Overview

2.1 Connecting to the PCM Test Set

Using the cables that came with the PCM test set:

1. Connect the test set TXDATA to the Motherboard DR (Data Receive).
2. Connect the test set RXDATA to the Motherboard DX_PCM (Data Transmit).
3. In most configurations, the clock and frame sync are supplied by the test set. Connect the test set CLOCK to the Motherboard CLKI_PCM. Connect the test set SYNC to the Motherboard FS_PCM.
4. It is important that the analog signals are connected to the correct analog connectors. There are both 2-wire and 4-wire ports and a selector switch on the Wandel & Goltermann PCM-4. Make sure that the correct connection and mode selection are used for the particular test being performed.
5. The DC loop supply connects the DC feed to the device under test (DUT) and AC couples the audio to the PCM channel test set. Refer to the documentation for the test set being used for details about requirements and limits.

2.2 Connecting the SPI to the PC

Using the supplied parallel interface cable:

1. Connect the 10-pin female end to the Motherboard GUI INTERFACE connector (J42) so that the ribbon extends outward away from the board.
2. Connect the 25-pin male end to the PC port.

2.3 Connecting to a Central Office Line Simulator

When interfacing the 73M1966B EVM analog signals to a PCM measuring set such as the Wandel & Goltermann PCM-4, it is necessary to provide DC loop current to the 73M1966B line interface in order for it to operate correctly. Figure 3 is an example of a circuit that can provide this function.

A simpler alternative that could be used in other applications is to use a current limiting resistor in series with a DC power supply. See Figure 4.

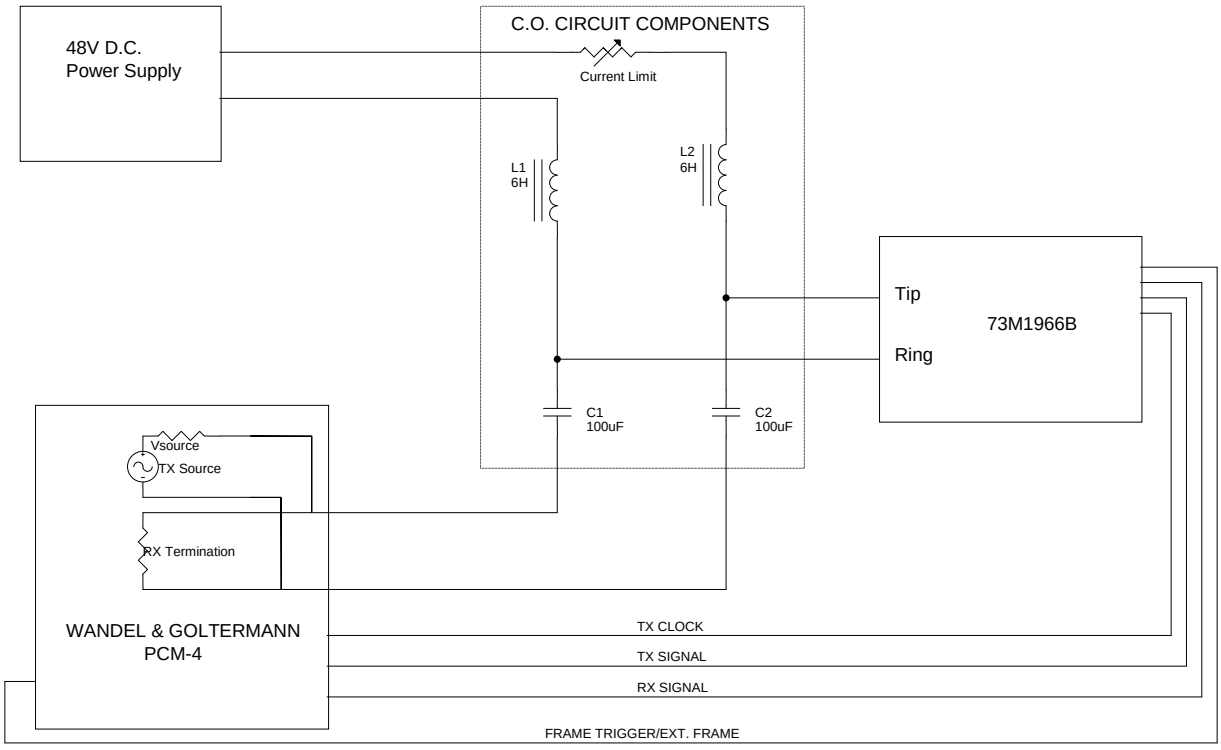

Figure 3: Central Office Line Simulator

The circuit setup shown in Figure 3 is required when using a PCM test set. It allows more flexibility and assures the power supply and current limit resistor will not affect the impedance selected in the PCM test set. The inductors isolate the power supply and have a high impedance at audio frequencies. The large coupling capacitors isolate the DC feed from the channel tester and have a very low impedance at audio frequencies to prevent measurement errors.

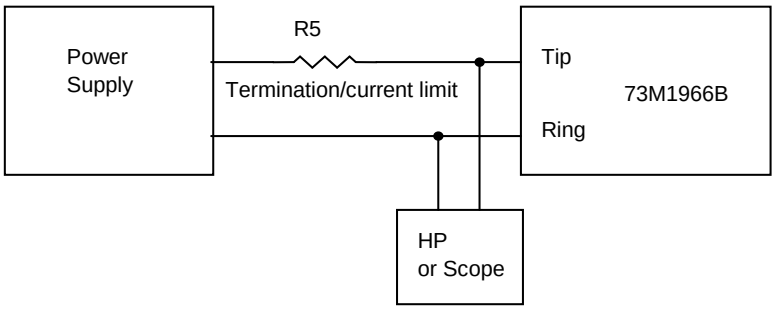

Figure 4: Simple DC Feed Circuit

Error! Reference source not found. illustrates how to use a series resistor DC feed. The series resistor does not work when using a channel tester like the Wandel & Goltermann because the current limiting resistor affects the termination impedance set inside the test set (see below). The effect is to cause erroneous results. For a 600 Ohm termination, the current limit resistor can be set to 600 Ohms and the DC voltage can then be adjusted to get the desired current. This arrangement does not take into consideration the power supply source resistance, however.

If the setting for the receive termination is set to a high impedance in the PCM-4, some transmit tests can be performed, but be sure the PCM-4 is AC coupled to the set-up! The PCM-4 does not allow DC input voltages. For receive tests, the current limit resistance will appear to the PCM-4 as an additional load in parallel with the impedance of the 73M1966B termination impedance, so the measurements will not be accurate.

2.3.1 Considerations When Connecting to the Telephone Network

Special care must be taken when using equipment connected to the telephone network RJ-11 socket. Equipment must not be connected to the ground of the main socket when using commercially available line simulators since these are intended to have a floating connection relative to power ground. Also, if one oscilloscope probe is connected between TIP, RING or other line-side points, the ground reference must also be connected to the network, not to ground. No other probe can be connected to the host side of the board to monitor other signals using the host ground as reference unless isolated grounds are supported for each channel. Oscilloscopes with isolated channels can be used. Separate ungrounded oscilloscopes (using a “cheater plug” on the power connector) can be used to monitor the line side only, but this can lead to additional noise when making measurements. If you use a non-commercial network simulator, some of these problems can be avoided, but care must still be taken with the connections.

2.4 Graphical User Interface

The 73M1966B comes with a Graphical User Interface (GUI) that allows access to various components on the board through a USB connection from a host PC computer running Windows XP. The GUI is used to configure the 73M1966B Demo Board, control the registers and read the status conditions of the board.

Install the GUI following the instructions in the *73M1866B/73M1966B GUI User Guide*.

2.5 Connecting the Power Supply

Before applying power, place the PWR switch in the down position.

There are two ways to supply power to the board:

- Use the supplied wall transformer that plugs directly into the board at J5. Do not use in conjunction with J1 and J2.
- Feed the board with 3.3 V and GND through the J1 and J2 connectors. Cables are not supplied. Do not use in conjunction with J5.

2.6 Applying Power

To apply power, place the PWR switch in the up position.

After applying power, press the RESET switch to ensure proper operation of the board.

3 Connectors and Jumpers

This section describes the connectors and jumpers on the 73M1966 Demo Motherboard.

Table 1: Motherboard Connectors and Jumpers

Connector Number	Name	Function
S1	4-pin daughterboard connector	Socket for the analog interface to the 73M1966B Demo Board.
S2	20-pin daughterboard connector	Socket for the digital interface and power to the 73M1966B Demo Board.
J1	VCC3.3	Banana jack for 3.3V lab supply connection. (Use either J1 and J2 or J5 but not both.) Using J1 and J2 is necessary only if testing over a range of voltage.
J2	GND	Banana jack for ground lab supply connection. (Use either J1 and J2 or J5 but not both.) Using J1 and J2 is necessary only if testing over a range of voltage.
J3	To Slave	Connector to connect SPI to slave demo board.
J4	From Master	Connector to connect SPI to master demo board.
J5	+5 V Power	Input for +5 V power supply which is down regulated on the Motherboard to 3.3 V. (Use either J5 or J1 and J2 but not both.)
J6	PCM Highway	Header connector to the PCM Highway.
J24	CLKO	BNC connector for the clock output.
J30	RJ-11 Connector	Connection to telephone network simulator.
J31, J32	PCM Highway	PCM Highway connectors for daisy chain operation. Only used to daisy chain two or more Motherboards.
J33	Reserved	
J41	Reserved	
J42	SPI Connector	Connect the cable from the PC to J42 to communicate to the SPI via the GUI. Take care to observe the orientation of the connector.
J43	CLKI	BNC connector for connecting an external PCM clock source or sync.
J44	FS	BNC connector for providing or receiving PCM frame sync..
J45	DR	BNC connector providing receive data from a PMC source to the demo board.
J46	DX	BNC connector providing transmit data to a PCM receiver from the demo board.
J47	Audio	Install jumper on the AUDIO pin and the middle pin to activate the speaker amplifier. By default, no jumper is installed and the speaker amplifier is not activated.
J57	On-Board Oscillator	Install jumper to enable the on-board oscillator. This is not normally used.

4 Using the Demo Boards

This section provides advice for using the 73M1966B Evaluation Kit with the Wandel & Goltermann PCM-4.

It is assumed that the connections described in Getting Started have been made, that the GUI has been installed following the instructions in the *73M1866B/73M1966B GUI User Guide*, and that power has been applied to the 73M1966 Demo Motherboard.

Initialize and configure the Demo Board for your application using the GUI. See the *73M1866B/73M1966B GUI User Guide*. The GUI software includes example scripts that configure the Demo Board for specific purposes.

The following is a suggested list of tests that can be performed using a PCM measuring set such as the W&E PCM-4:

- TX Gain – Tests the digital input to analog output level and its conformance to the required specifications. The effect of the gain setting bits can also be tested (DAA1:0, TXboost).
- RX gain- tests the analog input to digital output level and conformance to the required specifications. The effect of the gain setting bits can also be tested (RXG1:0, RX boost).
- TX/RX Gain versus Frequency – Tests the gain variation versus frequency across the audio band. Shows the passband ripple and adherence to the frequency response template.
- TX/RX Gain Linearity – Tests the gain linearity over the receive level dynamic range. Also sensitive to the RX DC offset and noise.
- Return Loss – Indicates the matching of the DUT impedance to the standard's reference impedance. Only impedances supported by the specific W&G PCM-4 can be tested. Other impedances must be tested using an impedance bridge and adjustable reference impedance. Most W&G PCM-4s support 600, 850 and 900 Ohms plus one "complex impedance," which can be ETSI, German or "custom" impedance. Some W&G PCM-4s may not support a complex impedance at all.
- Return Loss – TX digital to RX digital test to determine the amount of transmitted signal is reflected in the receive channel. A proper reference impedance and DC supply must be connected at the analog port of the DUT.
- TX/RX Total Distortion – Tests the dynamic range of the TX and RX channels and the effects of the compander. This test is also sensitive to the RX DC offset and noise. Must comply with the test template.

For information about typical test results and other relevant tests, refer to *73M1966B Performance Characterization*.

5 Motherboard Schematic, PCB Layouts and BOM

5.1 Schematic

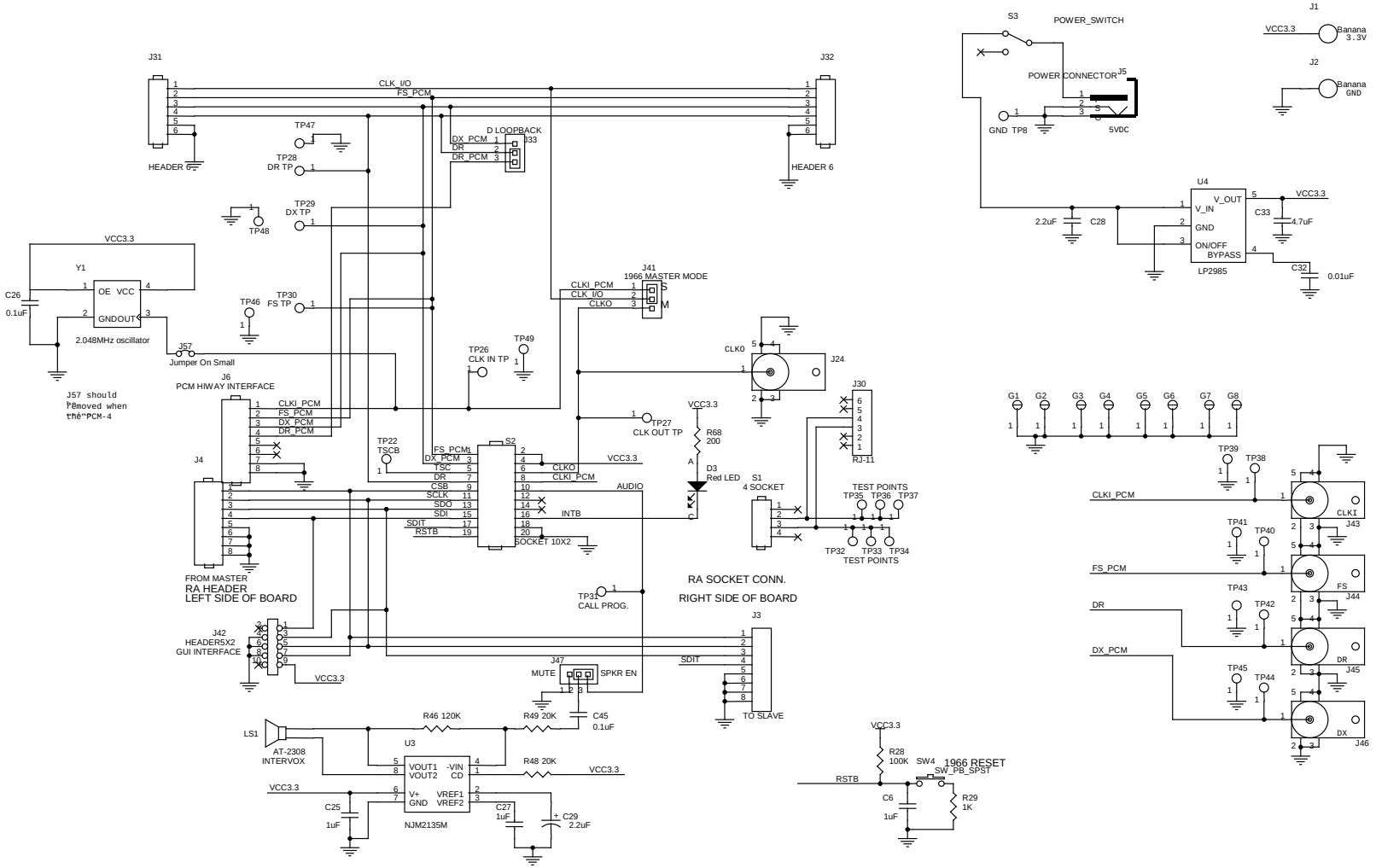

Figure 5: 73M1966 Motherboard Schematics

5.2 PCB Layouts

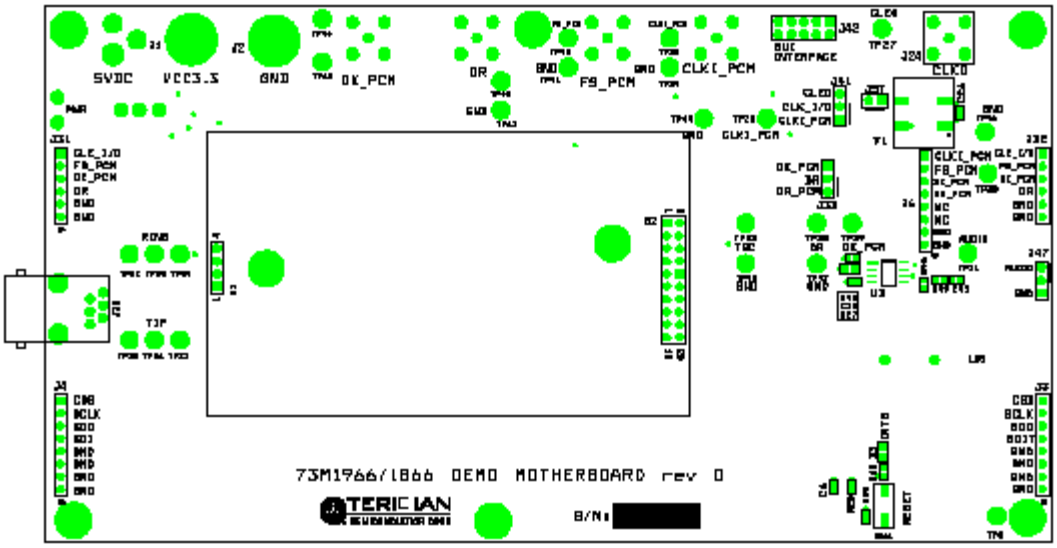

Figure 6: Motherboard: Silk Screen Top

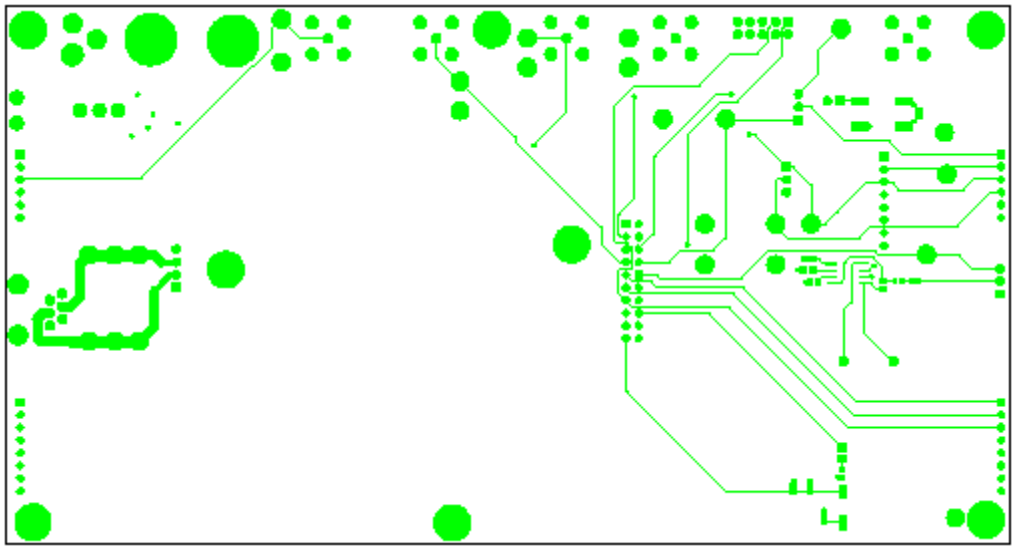

Figure 7: Motherboard: Top Layer

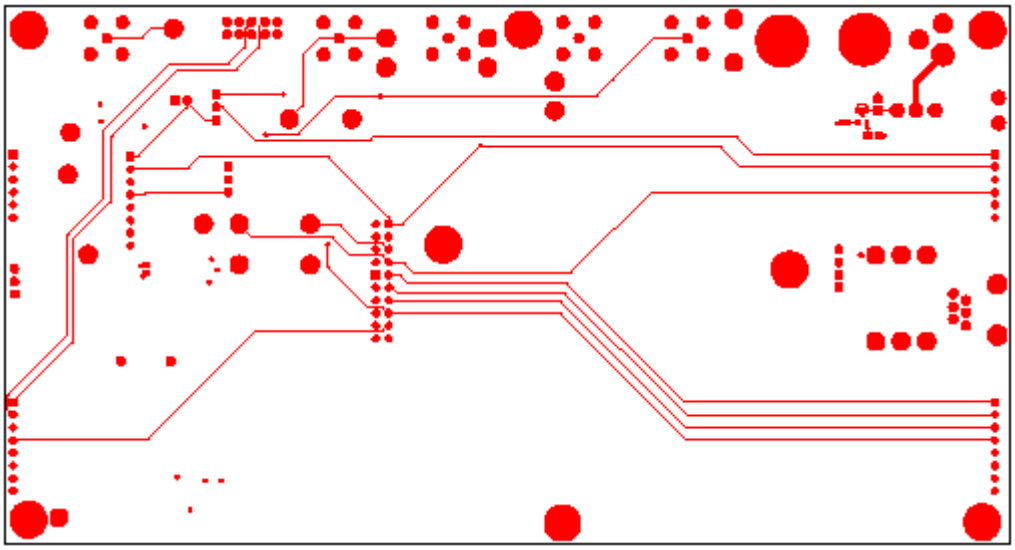

Figure 8: Motherboard: Bottom Layer

5.3 Bill of Materials

Table 2 provides the bill of materials for the 73M1966 Demo Motherboard schematic provided in Figure 5.

Table 2: Motherboard Bill of Materials

Qty	Reference	Part Description	Source	Example MFRP/N
5	J24,J43,J44,J45,J46	BNC RT Angle	AMP	5413631-1
1	J30	RJ-11	AMP	5555163-1
2	J31,J32	HEADER	Sullins	PBC36SAAN
3	J33,J41,J47	HEADER	Sullins	PBC36SAAN
1	J42	HEADER	Sullins	PBC36DAAN
1	J57	HEADER	Sullins	PBC36SAAN
1	LS1	Speaker	Projects Unlimited	AST-02308MR-R
1	R28	100K	Panasonic	ERJ-3GEYJ104V
1	R29	1K	Panasonic	ERJ-3GEYJ102V
1	R46	120K	Panasonic	ERJ-3GEYJ124V
2	R48,R49	20K	Panasonic	ERJ-3GEYJ203V
1	R68	200	Panasonic	ERJ-3GEY201V
1	S1	1x4 socket	Mill-Max Manufacturing	801-43-050-10-001000
1	S2	2x10 socket	Sullins	PPPC102LFBN-RC
1	S3	Switch	E-Switch	100SP1T2B4M7RE
1	SW4	Switch	Panasonic	EVQ-PJX05M
26	TP8,TP22,TP26-TP49	Test points	Keystone Electronics	5011
1	U3	Amplifier	NJR	NJM2135M
1	U4	LDO	National	LP2985IM5-3.3/NOPB
1	Y1	2.048MHz oscillator	Citizen	CMX309FBC2.048M-UT

6 Ordering Information

Table 3 lists the order numbers and packaging marks used to identify 73M1x66B Demo Boards.

Table 3: Order Numbers and Packaging Marks

Part Description	Order Number	Packaging Mark
73M1966B 20-Pin TSSOP Motherboard, Demo Board	73M1966-EVM	73M1916-M 73M1906B
73M1966B 20-Pin TSSOP Demo Board	73M1966-DB	73M1916-M 73M1906B
73M1866B 42-Pin QFN Keychain Demo Board	73M1866-Keychain	73M1866B-IM

7 Related Documentation

The following 73M1x66B documents are available from Teridian Semiconductor Corporation:

73M1866B/73M1966B Data Sheet
73M1966B Demo Board User Manual
73M1866B/73M1966B GUI User Guide
73M1x66 PCM Connectivity Application Note
73M1x66B Layout Guidelines
73M1x66B Worldwide Design Guide
73M1966B Performance Characterization

8 Contact Information

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Revision History

Revision	Date	Description
1.0	3/19/2009	First publication.

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