TERIDIAN SEMICONDUCTOR CORP.

Simplifying System Integration™

# 78Q8430
# ARM9(920T) Embest Evaluation Board
# User Manual

**May, 2008**
**Rev. 1.0**
**UM_8430_007**

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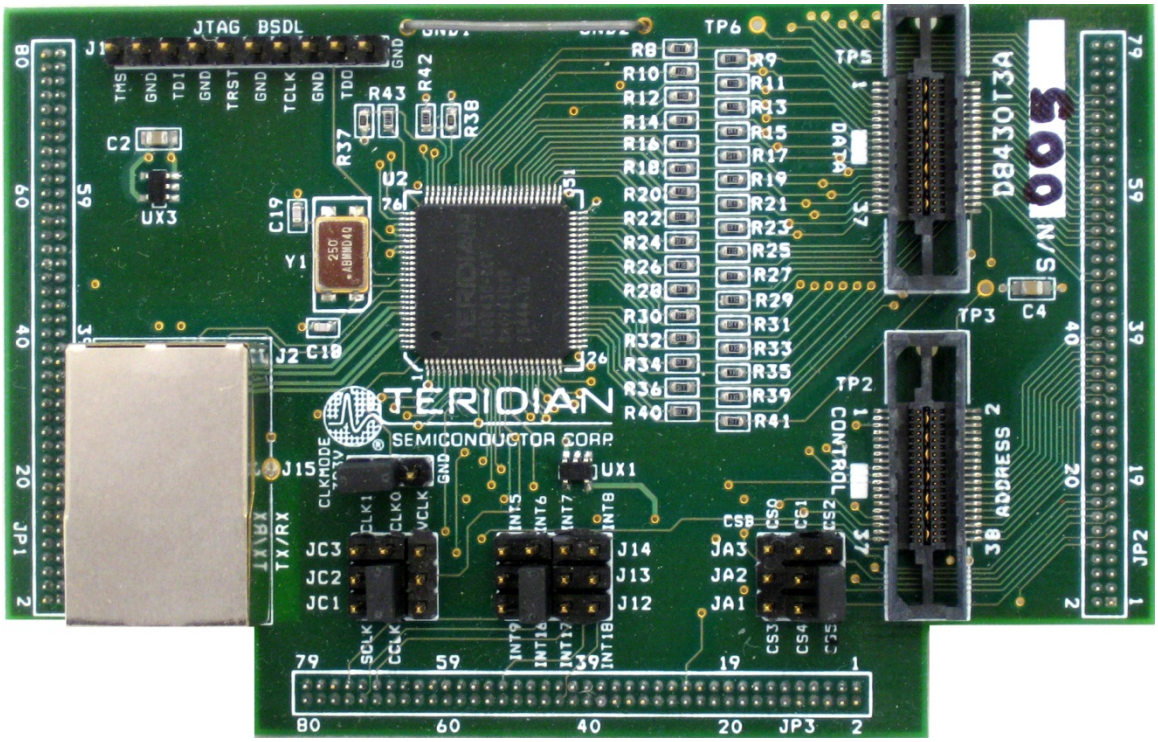
# 1 Introduction




The 78Q8430 Embest Evaluation Board (D8430T3A_EB) is a design example for a 10/100BASE-TX MAC+PHY Embest S3CEB2410 daughter card. The D8430T3A_EB plugs directly into the Embest S3CEB2410 (ARM9™ based) motherboard. The network connection is provided by the 78Q8430 which is a single chip auto-sensing, auto-switching (auto-negotiation or parallel detect modes and auto-MDIX) 10/100BASE-TX Fast Ethernet transceiver with full duplex operation capability. The device is designed specifically for the Audio/Visual (A/V) and Set Top Box (STB) markets and is easily interfaced to available A/V and STB core processors.

The 78Q8430 is compliant with applicable IEEE-802.3 standards. MAC and PHY configuration and status registers are provided as specified by IEEE802.3u. The integrated MAC is supported by an internal 32KByte transmit and receive SRAM FIFO. The partition of transmit and receive queues is configurable through software, allowing the 78Q8430 to be tuned for specific applications. The device contains hardware support for TCP-IP checksum and ARC address recognition.

The D8430T3A_EB provides support for the following 78Q8430 hardware interface features:

- The system bus interface operates like external memory with an active low chip select.
- Supports asynchronous big endian bus format.
- Supports asynchronous 100 MHz operation.
- Supports 32-bit wide data bus.
- Optional EEPROM interface for configuration data.
- Two programmable LED outputs for PHY status.
- Single +3.3V power supply voltage with a common ground plane.

A host processor interfaces directly to the FIFO via the Global Bus Interface (GBI). The D8430T3A_EB is configured for 32-bit big endian bus format. Figure 1 shows the 78Q8430 system interfaces.

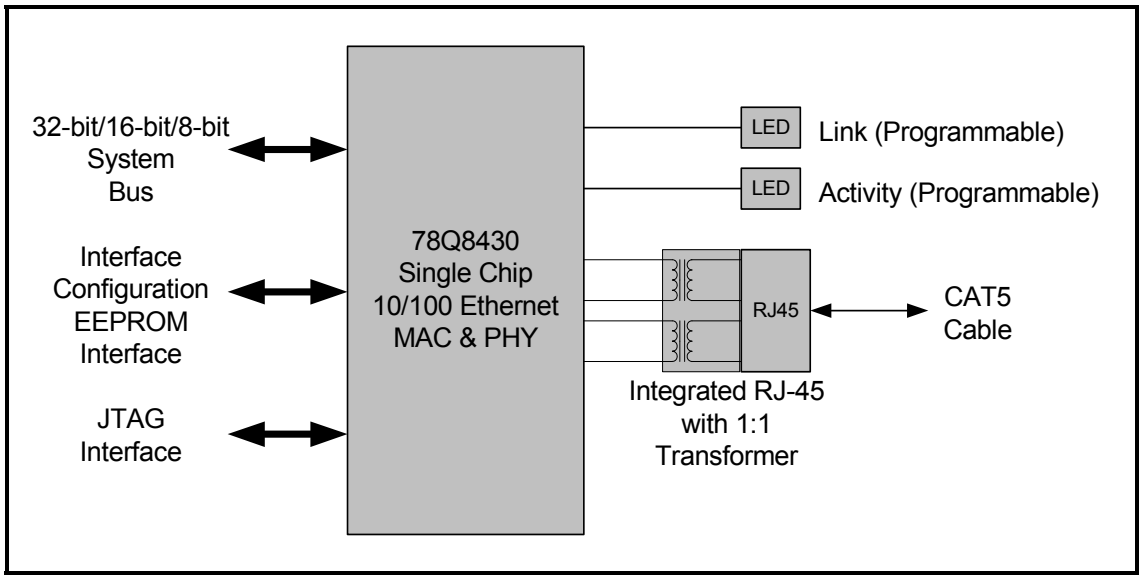



**Figure 1: 78Q8430 System Interface Diagram**

This document describes the setup and configuration of the 78Q8430 Embest Evaluation Board. The evaluation board requires operation with a +3.3 V power supply sourced from the Embest bus interface on the S3CEB2410 evaluation board. The 78Q8430 PHY interfaces to a CAT5 UTP cable via a 1:1 transformer.

The supplied software driver includes support for the Linux® operating system. The included *78Q8430 Software Driver Development Guidelines* and *78Q8430 ARM9 Linux Driver User and Test Guide* documents describe the software interfacing requirements for quick driver integration and prompt system evaluation of the 78Q8430.

Use this document with those listed in the Related Documentation section.

## 1.1 Package Contents

The 78Q8430 Embest Evaluation Board kit includes:

- A 78Q8430 Embest Evaluation Board (D8430T3A_EB).
- The Embest ARM9 S3CEB2410 evaluation platform.
- A memory card containing the 78Q8430 Linux software device driver and supporting tools.
- The following documents on CD:
  - *78Q8430 ARM9(920T) Embest Evaluation Board User Manual (this document)*
  - *78Q8430 Preliminary Data Sheet*
  - *78Q8430 Layout Guidelines*
  - *78Q8430 Software Driver Development Guidelines*
  - *78Q8430 78Q8430 Driver Guide for ARM920T Linux*
  - *78Q8430 ARM9(920T) Linux Driver Diagnostic Guide*

The printed circuit board Gerber files are available upon request.

## 1.2 Safety and ESD Notes

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


The evaluation boards are ESD sensitive! ESD precautions must be taken when handling these boards!

## 1.3 System Hardware Requirements

The following describes the minimum hardware requirements for the 78Q8430 Embest Evaluation Board system:

- The 78Q8430 Embest Evaluation Board (D8430T3A_EB).
- The Embest ARM9 S3CEB2410 evaluation platform.
- A PC to serve as the Linux host and control the ARM9 S3CEB2410 platform.

## 1.4 System Software Requirements

The following describes the minimum software requirements for evaluating the 78Q8430 Embest Evaluation Board:

- 78Q8430 ARM Linux 2.6.13 driver, version 1.1.
- Linux operating system supporting kernel 2.6.13.

# 2 System Setup

## 2.1 Jumper and Dip Switch Settings

The 78Q8430 Embest Evaluation Board utilizes several jumpers (JA, JC and J12 through J15) for establishing the startup configuration of the 78Q8430 device. Figure 2 shows the location of the jumpers. Table 1 describes the jumper options. The jumper numbers and settings are printed on the board.

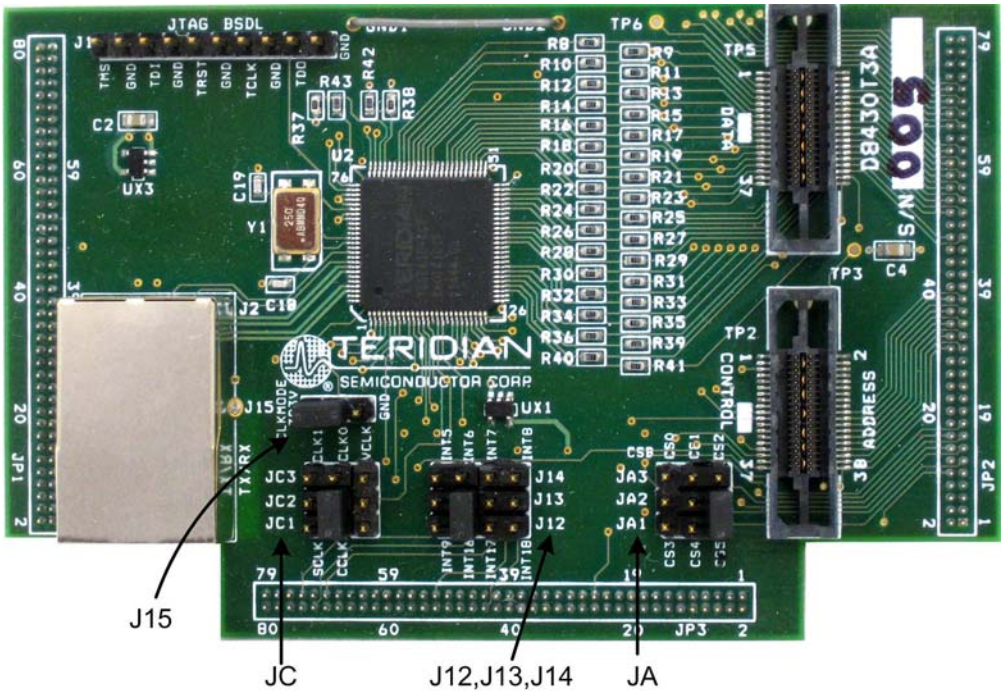



**Figure 2: 78Q8430 Embest Evaluation Board Jumper Locations**

**Table 1: 78Q8430 Embest Evaluation Board Jumper Settings**

| Jumper | Name | Setting | Description |
|---|---|---|---|
| J15 | CLKMODE Selection | GND | Internal clock. |
| | | 3P3V | External clock (default). |
| JA | Chip Select Source | CS0 | Selects the source for the 78Q8430 chip select signal. The default setting is CS5. |
| | | CS1 | |
| | | CS2 | |
| | | CS3 | |
| | | CS4 | |
| | | CS5 | |
| J12<br>J13<br>J14 | Interrupt Selection | INT5 | Selects the destination for the 78Q8430 Interrupt signal. The default setting is INT16. |
| | | INT6 | |
| | | INT7 | |
| | | INT8 | |
| | | INT9 | |
| | | INT16 | |
| | | INT17 | |
| | | INT18 | |

| Jumper | Name | Setting | Description |
|---|---|---|---|
| JC | Clock Source | CLK1 | Selects the source for the 78Q8430 clock. The default setting is CCLK. |
| | | CLK0 | |
| | | VCLK | |
| | | SCLK | |
| | | CCLK | |

## 2.2 Connections

Connect the system components as shown in Figure 3. Refer to the Embest S3CEB2410 documentation for additional information on the connections for that platform.

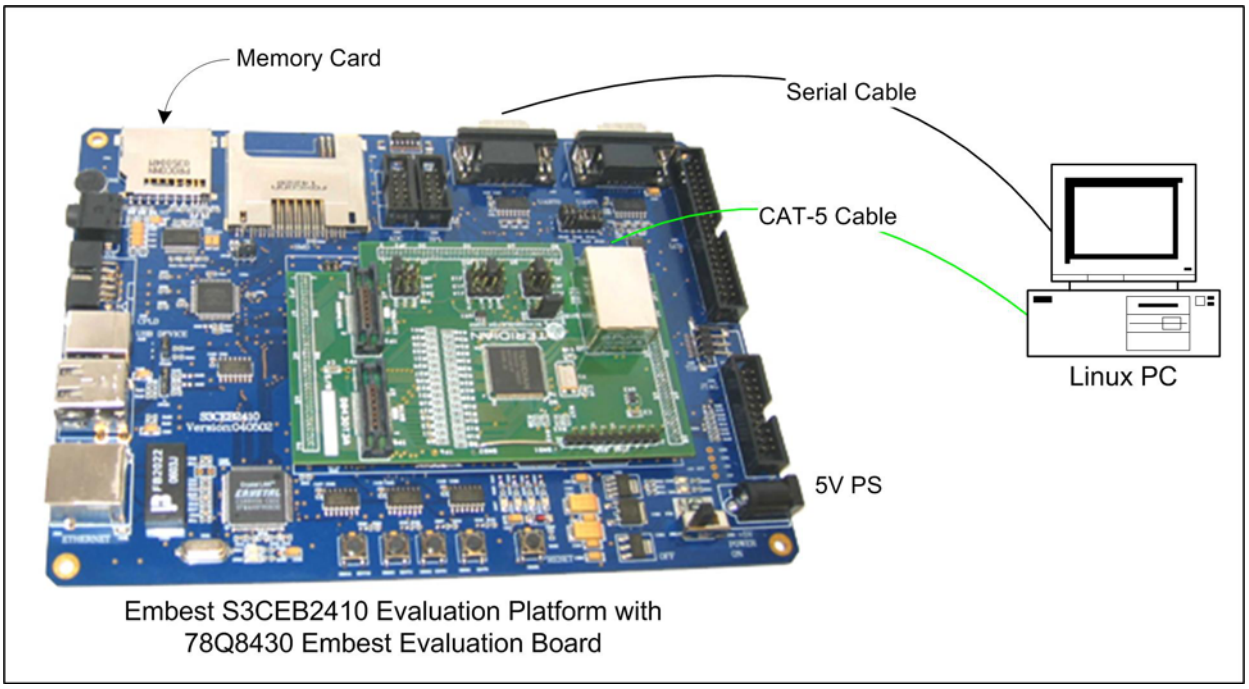



**Figure 3: 78Q8430 Embest Evaluation System Hardware Connections**

**STEP 1:** Attach the 78Q8430 Embest Evaluation Board to the S3CEB2410 Evaluation Board via the three connectors on the bottom of the 78Q8430 evaluation board.

**STEP 2:** Connect the 78Q8430 Embest Evaluation Board Ethernet port to the Linux PC using a CAT-5 cable.

**STEP 3:** Connect a serial console cable from the Linux Host PC serial port to the S3CEB2410 board serial port.

**STEP 4:** Insert the memory card containing the 78Q8430 Linux software device driver into the memory card slot on the S3CEB2410 board.

## 2.3 System Startup

**STEP 1:** On the Linux Host, set the testing port IP address to 192.168.10.100 (the S3CEB2410 platform boots with IP address 192.168.10.99).

**STEP 2:** Open a full height xterm or kconsole window on the Linux Host.

**STEP 3:** Start minicom on the Linux Host at the xterm/kconsole command prompt:
**~# minicom**

**STEP 4:** Turn on the S3CEB2410 board power. Refer to the S3CEB2410 documentation for additional information. The 78Q8430 Embest Evaluation Board receives its power through the Embest bus interface on the S3CEB2410 Evaluation Board.

**STEP 5:** Boot the S3CEB2410 Board. Console messages must appear in the minicom window after power on.

- Hit the space bar at the first boot prompt
- Respond with: **cpu set 200 2**
- On the next prompt, respond: **boot**

**STEP 6:** When boot up completes, enter the following at the prompt:
**arp -s 192.168.10.100 00:0E:2E:5B:25:86**

**STEP 7:** On the Linux Host, issue the following ping command to verify the connection to the target:
**ping 192.168.10.99**

# 3 78Q8430 Embest Evaluation Board Schematic, BOM and PCB Layout

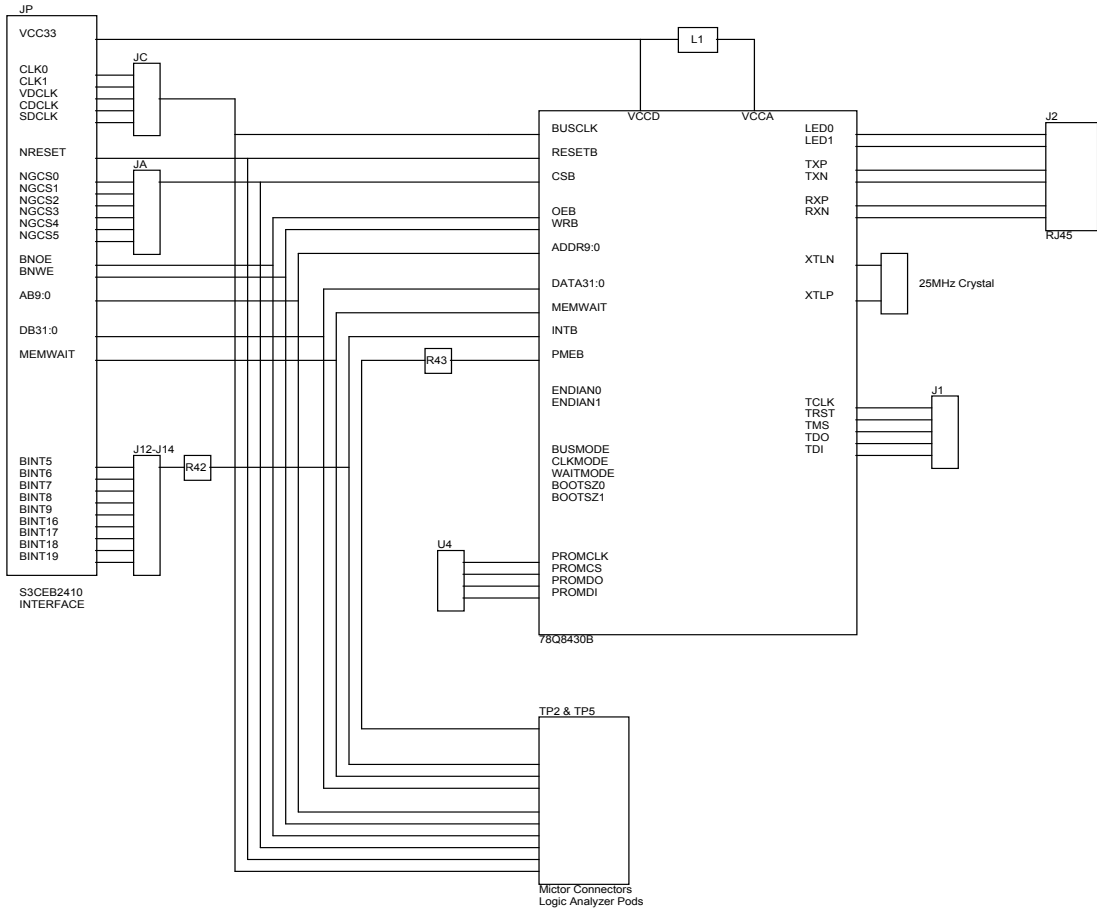



**Figure 4: Bus Interface Block Diagram**

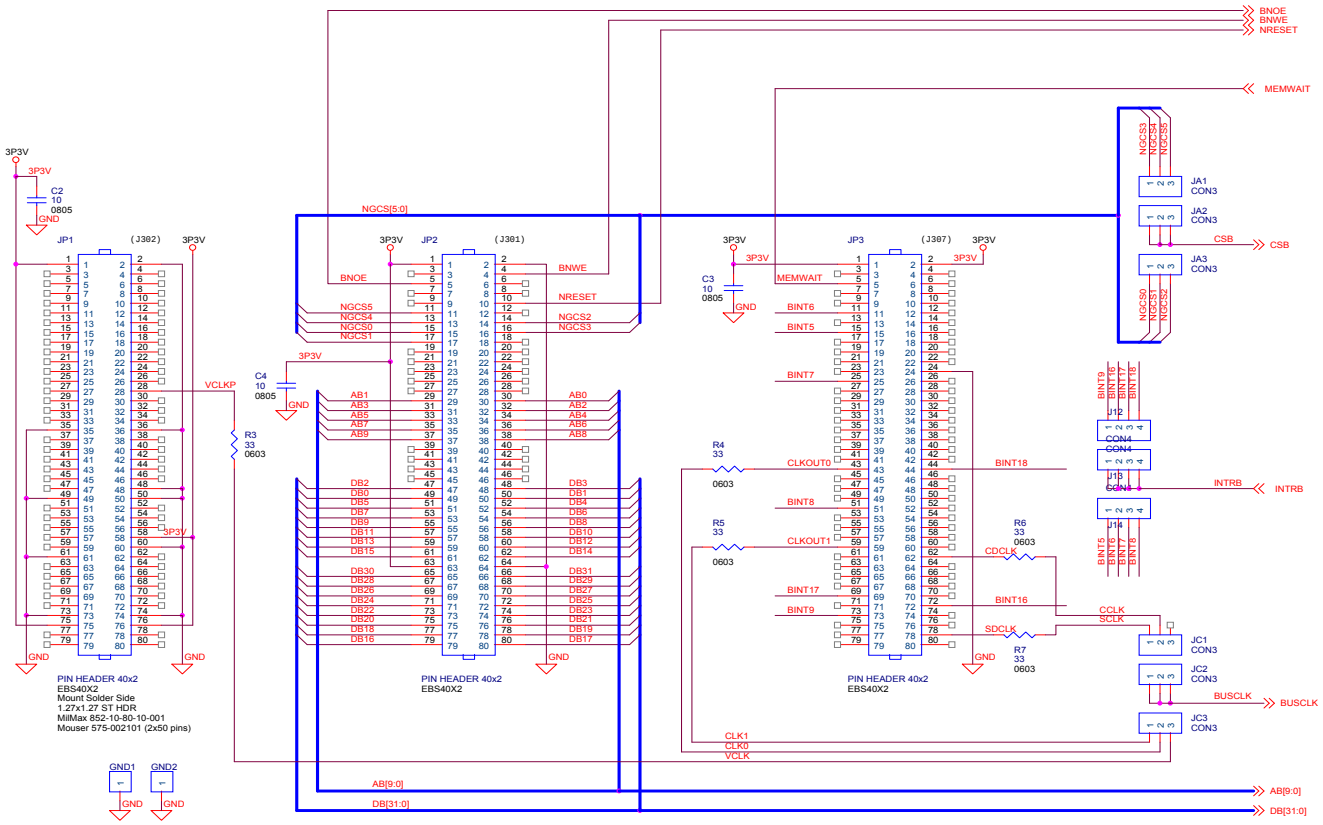



**Figure 5: Bus Interface Schematic**

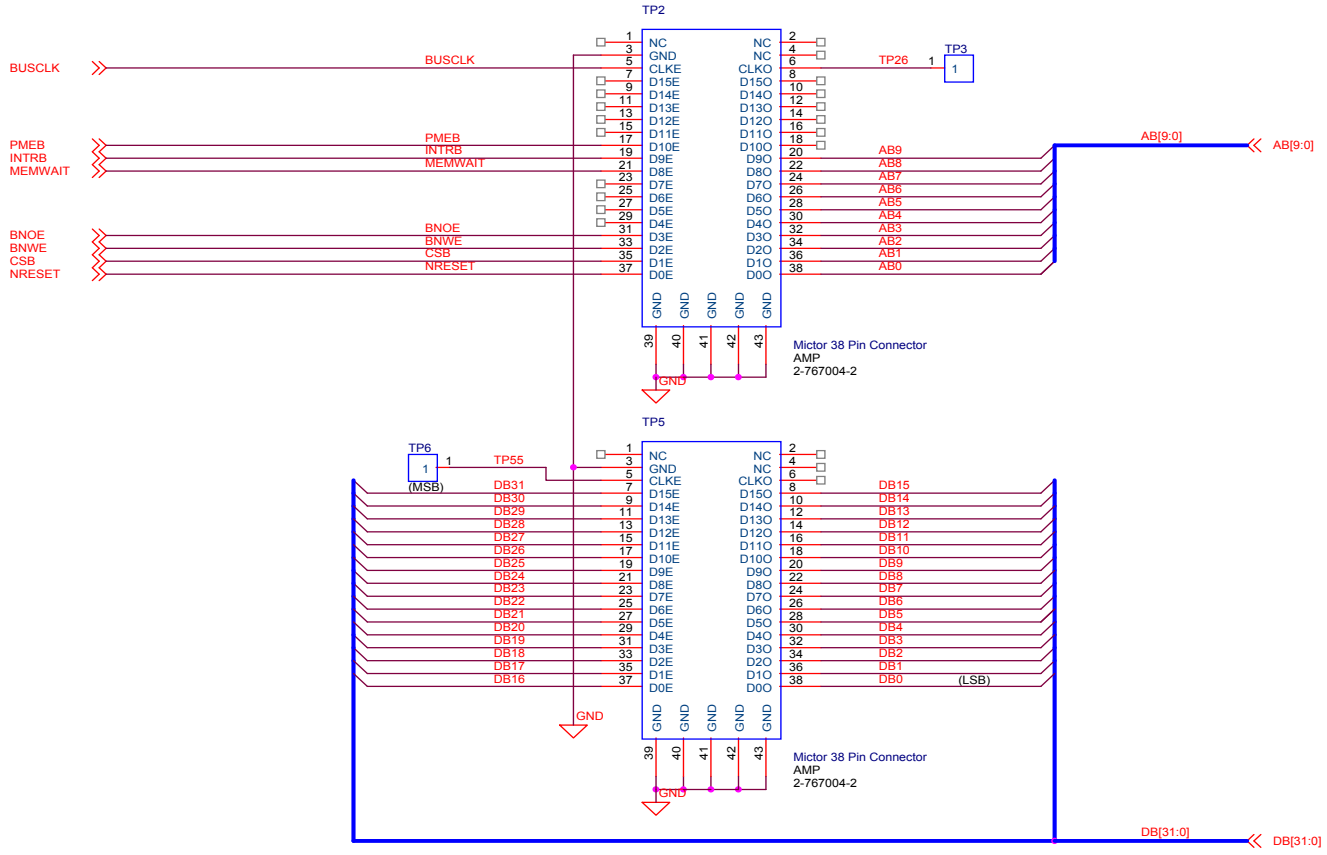



**Figure 6: MICTOR Diagnostic Connectors Schematic**

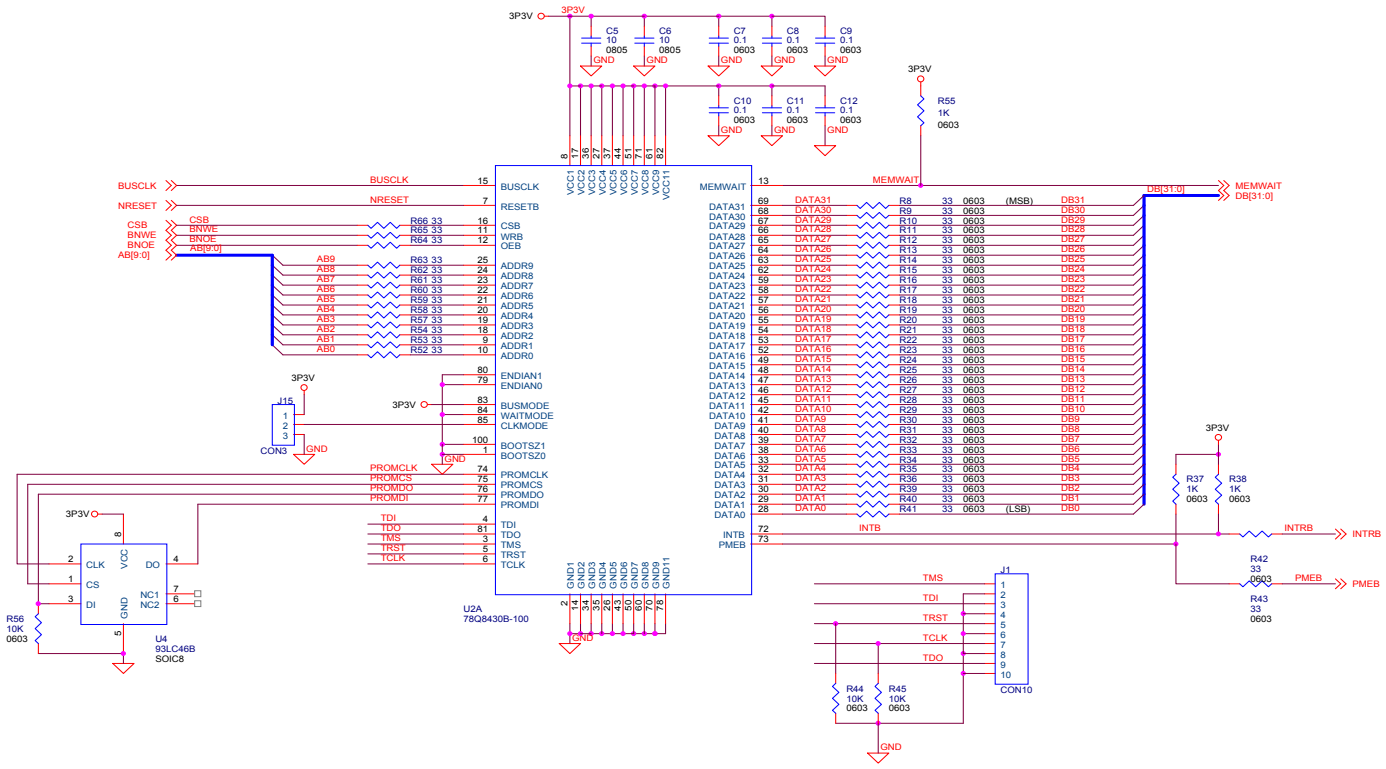



**Figure 7: MAC Interface Schematic**

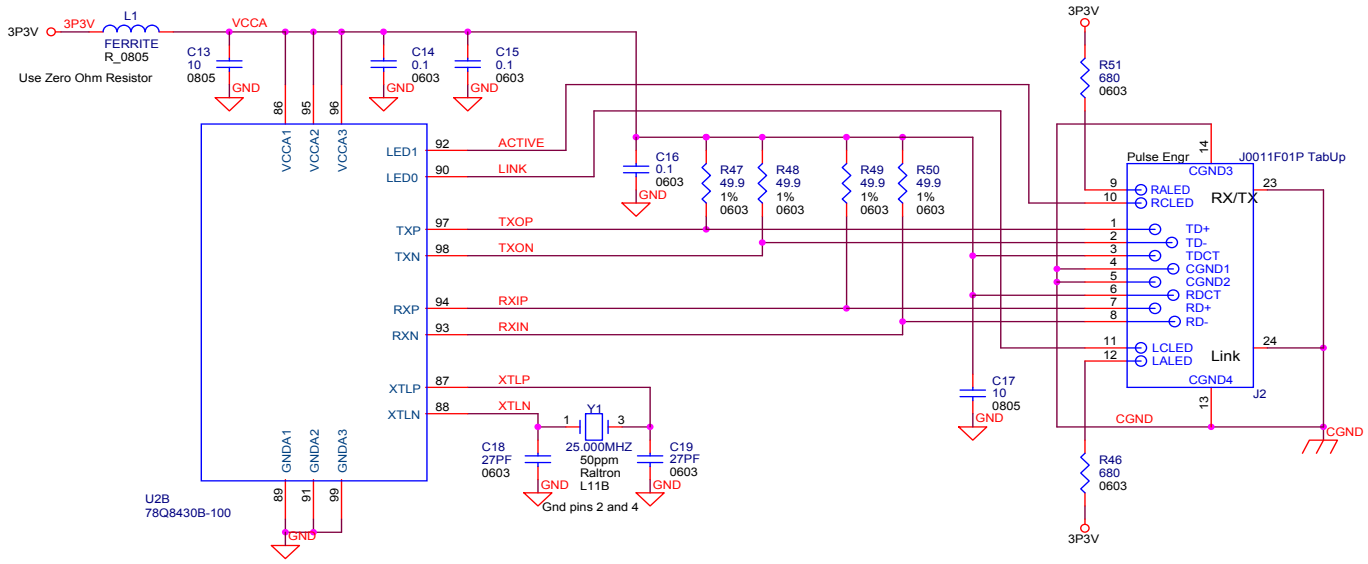



**Figure 8: PHY Interface Schematic**

**Table 2: 78Q8430 Embest Evaluation Board Bill of Materials**

| Item | Quantity | Reference | Part | PCB Footprint | Part Number | Vendor |
|---|---|---|---|---|---|---|
| 1 | 2 | C18,C19 | CAP., 27pF, 50V | C_0603 | C1608C0G1H270J | TDK |
| 2 | 9 | C7-C12,C14-C16 | CAP., 0.1uF,16V | C_0603 | ECJ-1VB1E104K | Panasonic |
| 3 | 7 | C2-C6,C13,C17 | CAP.,10uF,10V | C_0805 | GRM21BR61A106 KE19L | Murata |
| 4 | 2 | TP3,TP6 | CON1 | Testpoint | 5011 | Keystone |
| 5 | 7 | JA1-JA3,JC1-JC3, J15 | SIP3 | SIP\3P | PBC03SAAN | Sullins Electronics Corp |
| 6 | 3 | J12,J13,J14 | SIP4 | SIP\4P | PBC04SAAN | Sullins Electronics Corp |
| 7 | 1 | J1 | CON10 | SIP\10P | PBC10SAAN | Sullins Electronics Corp |
| 8 | 3 | JP1-JP3 | 40-Pin Header | EBS40X2 | 852-10-100-10-001000 | Mill Max |
| 9 | 1 | J2 | Integrated RJ45 | RJ45-INT | J1011F01P | Pulse Eng |
| 10 | 1 | Y1 | 25MHz Crystal | XTAL-SMD | ABMM-25MHz | Abracon |
| 11 | 1 | L1 | Ferrite Bead | L_0805 | MMZ2012S181A | TDK |
| 12 | 3 | R44,R45,R56 | RES, 10k, 5% | R_0603 | ERJ-3GEYJ103V | Panasonic |
| 13 | 3 | R37,R38,R55 | RES, 1k, 1% | R_0603 | ERJ-EEKF1001V | Panasonic |
| 14 | 4 | R47-R50 | RES, 49.9, 1% | R_0603 | ERJ-3EKF49R9V | Panasonic |
| 15 | 52 | R3-R36,R39-R43, R52,R53,R54, R57-R66 | RES, 33, 5% | R_0603 | ERJ-3GEYJ330V | Panasonic |
| 16 | 2 | R46,R51 | RES, 680, 5% | R_0603 | ERJ-3GEYJ681V | Panasonic |
| 17 | 2 | TP2,TP5 | Mictor 38-pin | MICTOR | 2-767004-2 | Tyco |
| 18 | 1 | L1 | Ferrite Bead | L_0805 | MMZ2012S181A | TDK |
| 19 | 1 | U2 | 78Q8430 | 100 LQFP | 78Q8430 | Teridian Semiconductor |
| 20 | 1 | U4 | 93LC46 | SOIC8 | 93LC46BT-I/SN | Microchip |

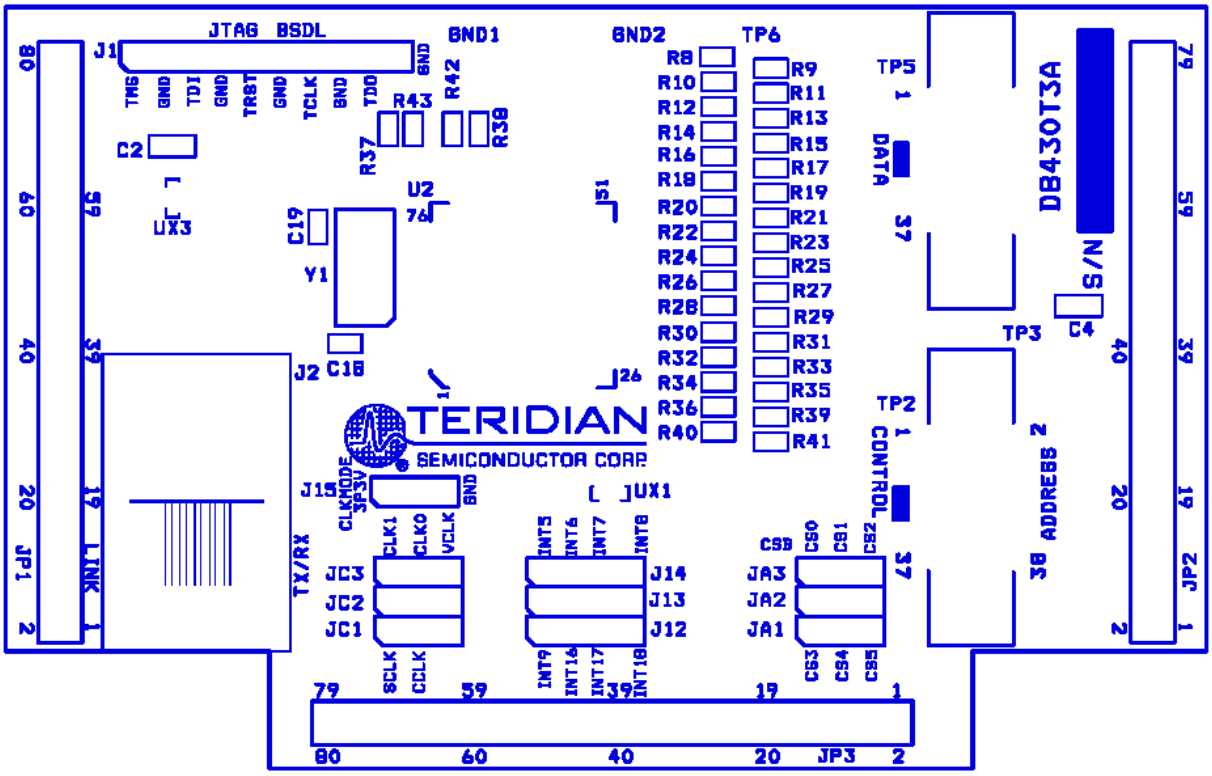



**Figure 9: Top Silkscreen Layout**

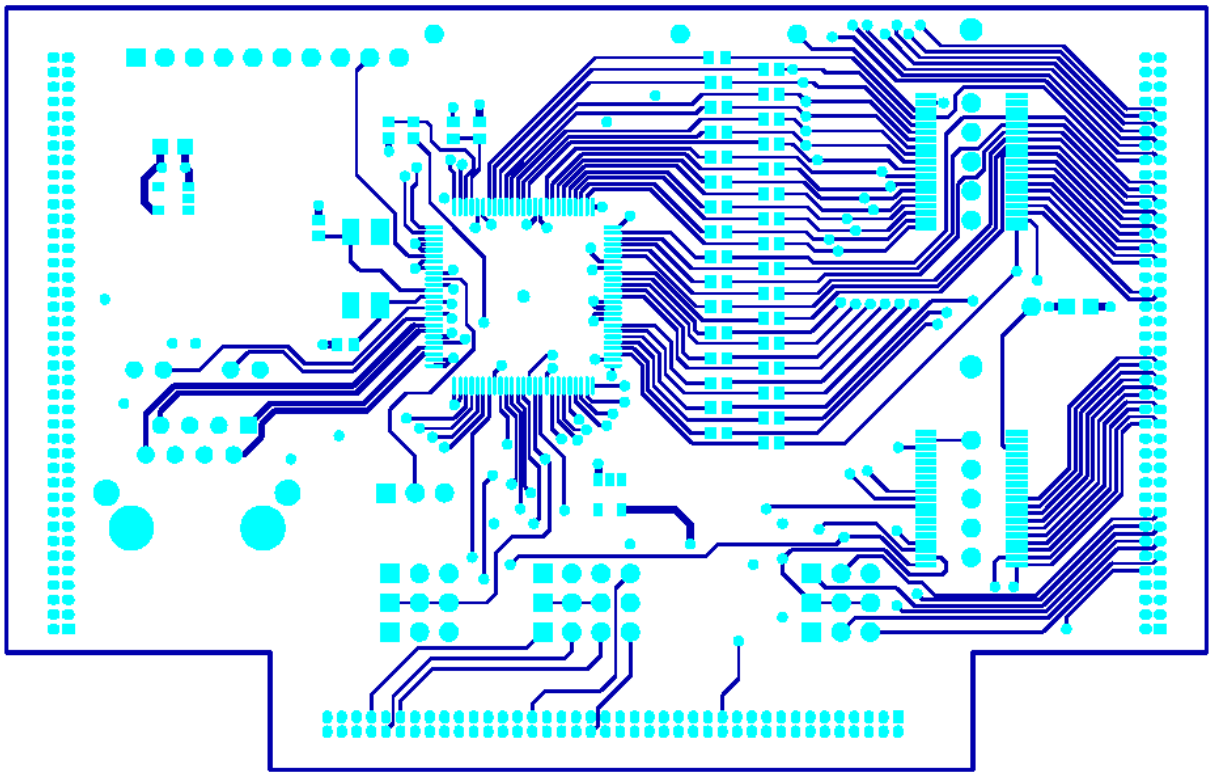


**Figure 10: Top Layer Layout**

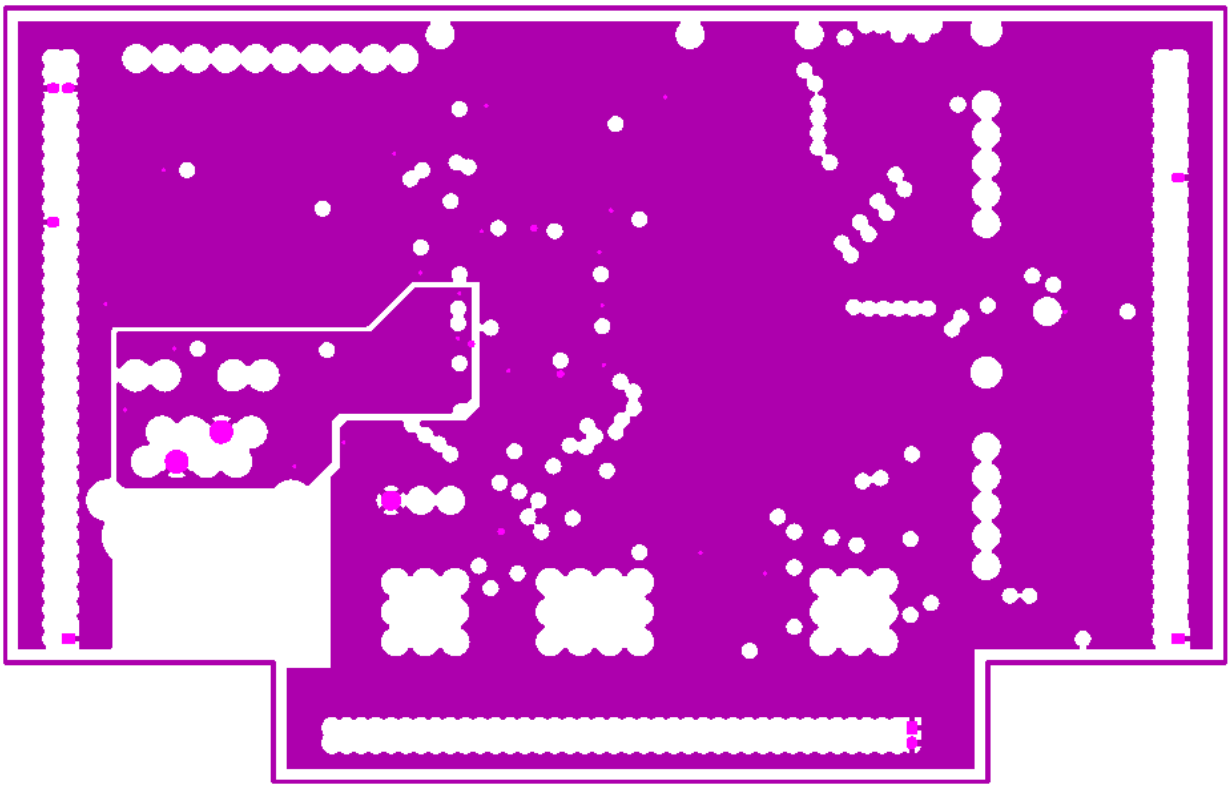


**Figure 11: VCC Layer Layout**

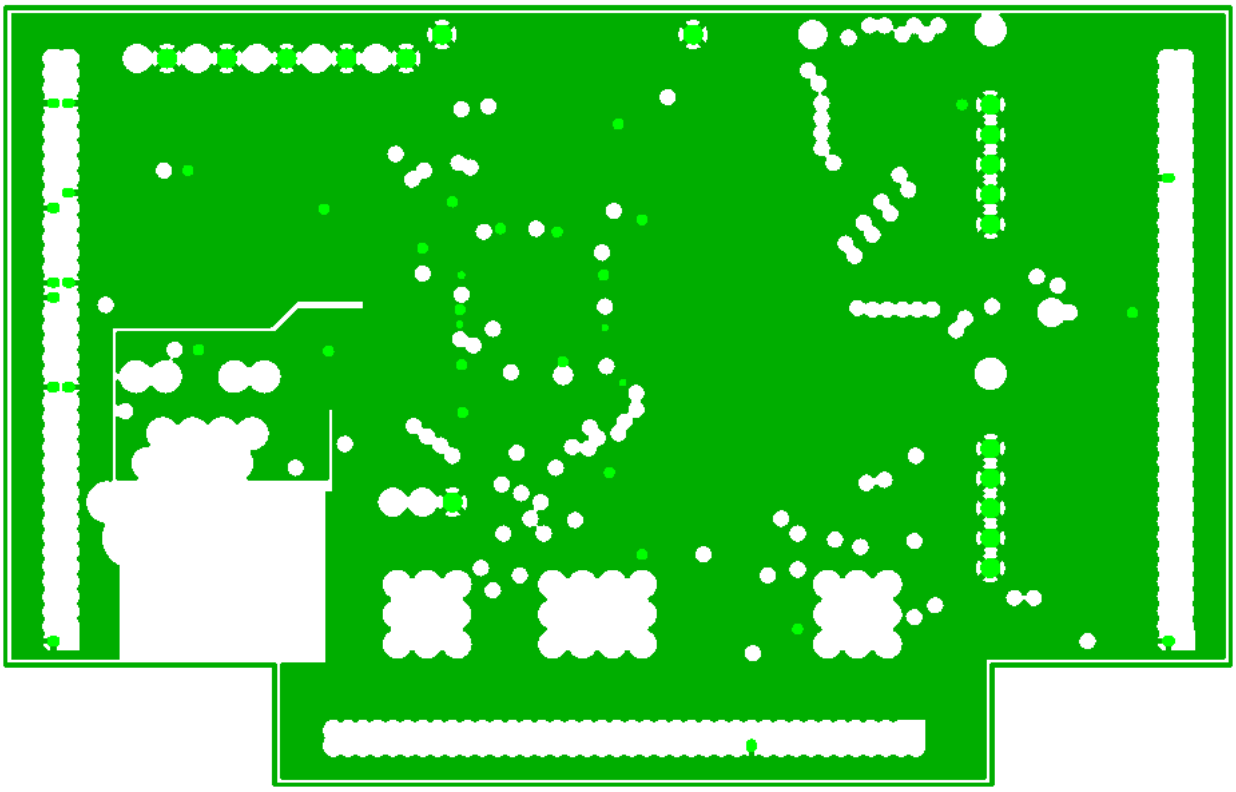


**Figure 12: Ground Layer Layout**

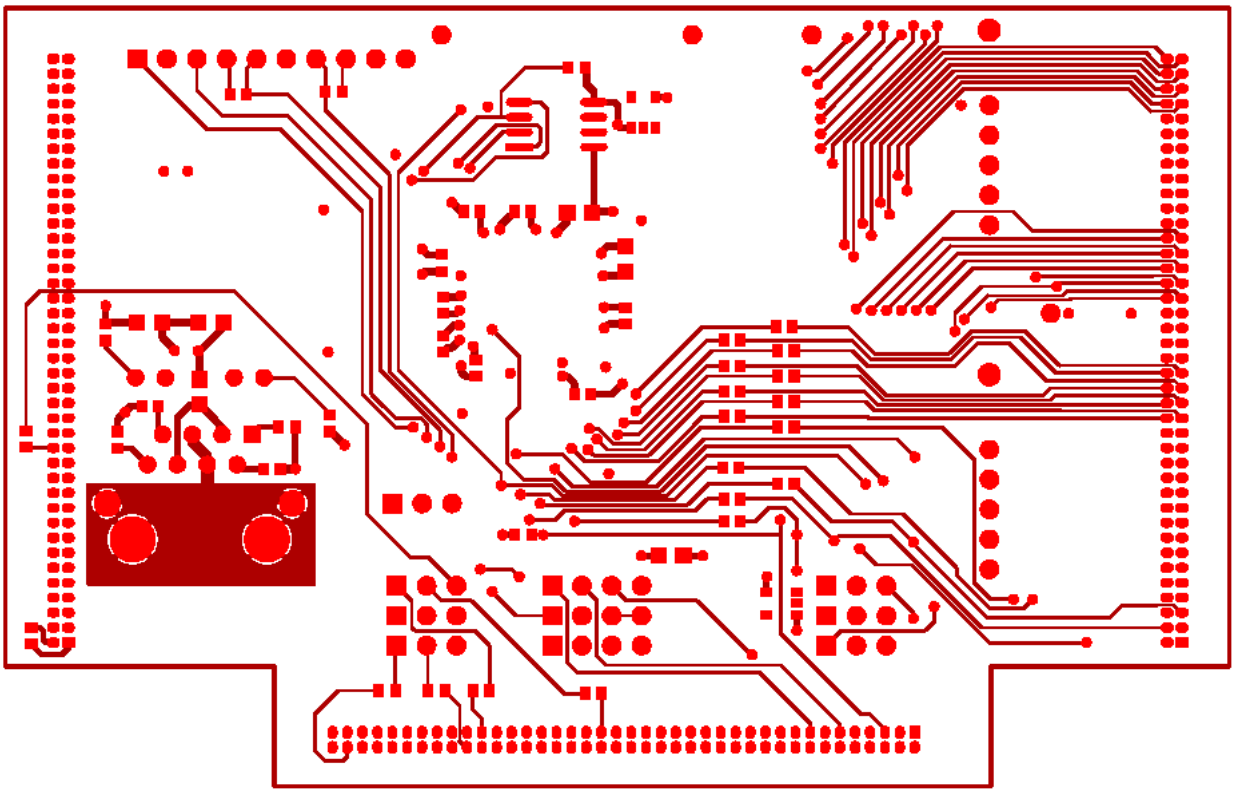


**Figure 13: Bottom Layer Layout**

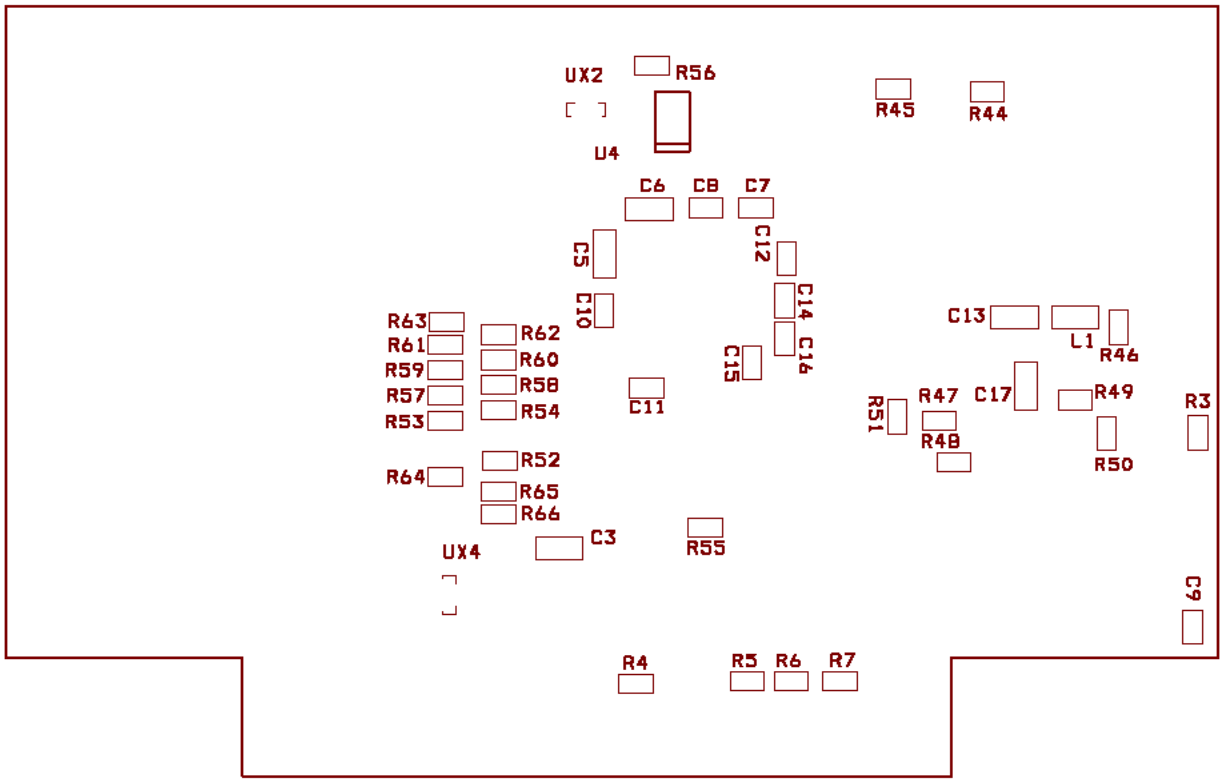



**Figure 14: Bottom Silkscreen Layout**

# 4 Ordering Information

Table 3 lists the order number for the 78Q8430 Embest Evaluation Board.

**Table 3: Order Number and Part Description**

| Part Description | Order Number |
|---|---|
| 78Q8430 Embest Evaluation Board (D8430T3A_EB) | EVM8430-ARM9 |

# 5 Related Documentation

The following 78Q8430 documents are available from Teridian Semiconductor Corporation:

*78Q8430 Preliminary Data Sheet*
*78Q8430 Layout Guidelines*
*78Q8430 Software Driver Development Guidelines*
*78Q8430 Driver Guide for ST 5100/OS-20 with NexGen TCP/IP Stack*
*78Q8430 STEM Demo Board User Manual*
*78Q8430 Driver Guide for ARM920T Linux*
*78Q8430 ARM9(920T) Embest Evaluation Board User Manual*
*78Q8430 ARM9(920T) Linux Driver Diagnostic Guide*

# 6 Contact Information

For more information about Teridian Semiconductor products or to check the availability of the 78Q8430, contact us at:

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## Revision History

| Revision | Date | Description |
|---|---|---|
| 1.0 | May 6, 2008 | First Publication |