



LAN9500/LAN9500i

LAN9500/LAN9500i Product Introduction

Revision 1.1 (06-25-08)

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Table of Contents

| | |
|-------------------------------------|----------|
| Chapter 1 Introduction | 5 |
| 1.1 Overview | 5 |
| 1.2 Block Diagram | 5 |

| | |
|---|----------|
| Chapter 2 Ordering Information | 6 |
|---|----------|

| | |
|--|----------|
| Chapter 3 Target Applications | 7 |
|--|----------|

| | |
|--|----------|
| Chapter 4 LAN9500 Customer Evaluation Boards | 8 |
| 4.1 LAN9500 CEB | 8 |
| 4.2 LAN9500 CEB with MII Interface | 10 |
| 4.2.1 LAN9500 CEB with MII Interface - Jumper Settings | 10 |

| | |
|--|-----------|
| Chapter 5 Software Support | 11 |
| 5.1 Device Driver Support | 11 |
| 5.1.1 Device Driver Installer for PC | 11 |
| 5.2 Manufacturing and Diagnostic Tools | 11 |

| | |
|--|-----------|
| Chapter 6 Related Technical Resources | 12 |
|--|-----------|

| | |
|---|-----------|
| Chapter 7 Frequently Asked Questions | 13 |
|---|-----------|



List of Figures

| | | |
|------------|--------------------------------|---|
| Figure 1.1 | LAN9500/LAN9500i Block Diagram | 5 |
| Figure 4.1 | LAN9500 CEB | 8 |
| Figure 4.2 | LAN9500 CEB - Board Top | 8 |
| Figure 4.3 | LAN9500 CEB - Board Bottom | 9 |



LAN9500/LAN9500i Product Introduction

List Of Tables

| | | |
|-----------|--|----|
| Table 2.1 | LAN9500/LAN9500i Ordering Information | 6 |
| Table 2.2 | LAN9500 Customer Evaluation Board Ordering Information | 6 |
| Table 3.1 | LAN9500/LAN9500i Target Applications | 7 |
| Table 4.1 | LAN9500 CEB with MII Interface Jumper Settings | 10 |
| Table 6.1 | LAN9500/LAN9500i Technical Resources | 12 |

Chapter 1 Introduction

1.1 Overview

The LAN9500/LAN9500i is a high performance, small form factor solution for USB to 10/100 Ethernet port bridging. With applications ranging from embedded systems, set-top boxes, and PVR's, to USB port replicators, USB to Ethernet adapters, PC docking stations, and test instrumentation, the LAN9500/LAN9500i is targeted as a high performance, low cost USB/Ethernet connectivity solution.

The LAN9500/LAN9500i contains an integrated 10/100 Ethernet PHY, USB PHY, Hi-Speed USB 2.0 device controller, 10/100 Ethernet MAC, TAP controller, EEPROM controller, and a FIFO controller with a total of 30 KB of internal packet buffering. The internal Ethernet PHY may be optionally disabled. When not using the internal Ethernet PHY, an external MII interface is available for an external Fast Ethernet PHY, HomePNA, or HomePlug functionality.

The internal USB 2.0 device controller and USB PHY are compliant with the USB 2.0 Hi-Speed standard. The LAN9500/LAN9500i implements Control, Interrupt, Bulk-in, and Bulk-out USB Endpoints. The Ethernet controller supports auto-negotiation, auto-polarity correction, HP Auto-MDIX, and is compliant with the IEEE 802.3 and IEEE 802.3u standards.

An internal EEPROM controller exists to load various USB configuration information and the device MAC address. The integrated IEEE 1149.1 compliant TAP controller provides boundary scan via JTAG. Additionally, host management is available via USB in-band vendor commands (Register Read / Register Write).

Multiple power management features are provided, including various low power modes and "Magic Packet", "Wake On LAN", and "Link Status Change" wake events. These wake events can be programmed to initiate a USB remote wakeup.

LAN9500/LAN9500i software drivers are available for Windows XP, Windows Vista, Mac OSX, Linux, and Win CE. In addition, manufacturing and diagnostic tools are available for debugging and external EEPROM configuration.

1.2 Block Diagram

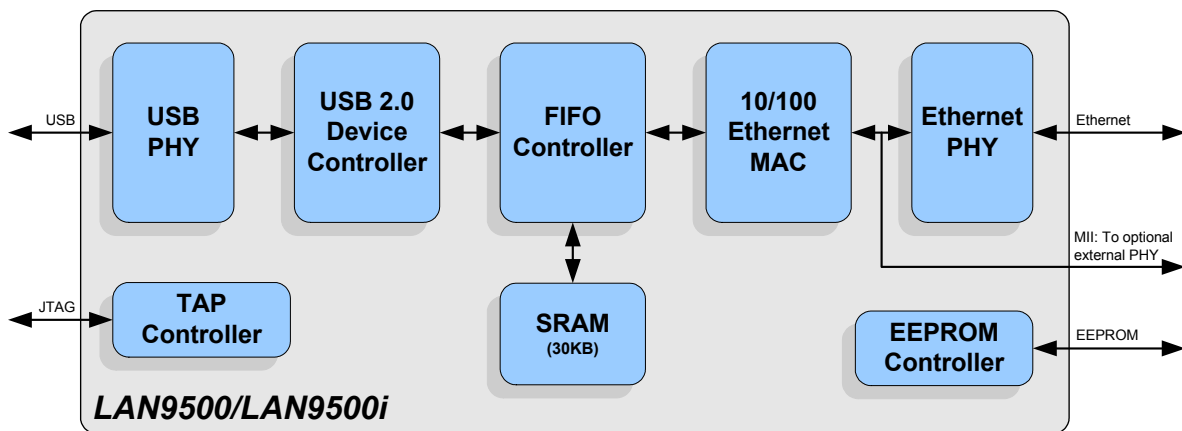


Figure 1.1 LAN9500/LAN9500i Block Diagram

Chapter 2 Ordering Information

The LAN9500/LAN9500i is available in commercial and industrial temperature ranges. [Table 2.1](#) details the available LAN9500/LAN9500i ordering codes. To order, contact your local SMSC sales office.

Table 2.1 LAN9500/LAN9500i Ordering Information

| ORDER CODE | DESCRIPTION |
|----------------------|--|
| LAN9500-ABZJ | 56-Pin QFN Lead-Free RoHS Compliant Package (0 to +70°C Temperature Range) |
| LAN9500i-ABZJ | 56-Pin QFN Lead-Free RoHS Compliant Package (-40 to +85°C Temperature Range) |

SMSC offers two distinct LAN9500/LAN9500i customer evaluation boards (CEBs) as detailed in [Table 2.2](#). For additional details on these boards, refer to [Chapter 4](#). To order, contact your local SMSC sales office.

Table 2.2 LAN9500 Customer Evaluation Board Ordering Information

| ORDER CODE | DESCRIPTION |
|-------------------|--|
| EVB9500 | LAN9500 Customer Evaluation Board (CEB) |
| EVB9500MII | LAN9500 Customer Evaluation Board (CEB) with MII Interface |

Chapter 3 Target Applications

The LAN9500/LAN9500i is targeted for a wide range of applications in the consumer electronics and industrial markets. Target applications include:

Table 3.1 LAN9500/LAN9500i Target Applications

| | | |
|--|--|--|
|  <p>Set-Top Boxes / PVR's</p> |  <p>USB to Ethernet Adapter</p> |  <p>Networked Printers</p> |
|  <p>CE Devices / IPTV</p> |  <p>Embedded Systems</p> |  <p>Industrial</p> |
|  <p>Mobile PC's / Docking Stations</p> |  <p>Test Instrumentation</p> |  <p>USB Port Replicators</p> |

Chapter 4 LAN9500 Customer Evaluation Boards

SMSC provides two LAN9500 customer evaluation boards, a LAN9500 CEB (non-MII) and a LAN9500 CEB with MII interface. The LAN9500 CEB provides a USB and Ethernet connection, while the LAN9500 CEB with MII interface provides an additional user accessible MII interface.

4.1 LAN9500 CEB

Photos of the LAN9500 CEB are provided in [Figure 4.1](#) through [Figure 4.3](#). The LAN9500 CEB does not include any jumpers. All device configuration is performed via software.



Figure 4.1 LAN9500 CEB



Figure 4.2 LAN9500 CEB - Board Top



Figure 4.3 LAN9500 CEB - Board Bottom

4.2 LAN9500 CEB with MII Interface

The LAN9500 CEB with MII interface provides the same functionality as the LAN9500 CEB (non-MII) with additional features. The LAN9500 CEB with MII interface provides a user accessible MII interface for connection to an external PHY and a JTAG debugging interface. The provided jumpers allow for additional configuration of the device, including the option to set the device to bus-powered or self-powered mode.

4.2.1 LAN9500 CEB with MII Interface - Jumper Settings

Table 4.1 details the various jumper settings available on the LAN9500 customer evaluation board with MII interface. A dashed line “---” shown in the “Position” column indicates the board’s default jumper setting. These settings may be changed as needed. However, any deviation from the default settings must be approached with care and knowledge of the board. An incorrect jumper setting may disable the board.

Table 4.1 LAN9500 CEB with MII Interface Jumper Settings

| JUMPER | DESCRIPTION | POSITION | SETTINGS |
|--------|---|----------------|---|
| JP1 | SMSC Test Jumper | 1 2 | This jumper must always be left unconnected. |
| JP2 | JTAG Connect Jumper | 1 2 | IN: Bus switch connects JTAG header to MII/JTAG pins OUT: Bus switch disconnects JTAG header from MII/JTAG pins |
| JP3 | PHY Control Jumper (Note 4.1) | 1 2 2-----3 | Enables external PHY Enables internal PHY |
| JP4 | +5V MII Connect Jumper | 1 2 | IN: Connects +5V to MII connector OUT: Disconnects +5V from MII connector |
| JP5 | Power Supply Control Jumper (Note 4.2) | 1-----2 2 3 | Device is bus powered via USB cable (JP4 must be removed) Device is external +5V supply powered |
| JP6 | 3.3V Reg. Connect Jumper (Note 4.2) | 1-----2 | IN: 3.3V regulator connected to 3.3V plane OUT: 3.3V regulator disconnected from 3.3V plane |
| JP7 | VBUS_DET Connect Jumper | 1-----2 2 3 | VBUS_DET connected to +3.3V (use when bus powered) VBUS_DET connected to resistor divider and capacitor circuit. (provides filtering, voltage divider and bleed path for VBUS_DET when USB cable is disconnected) |

Note 4.1 When an external PHY is connected to the MII port of the LAN9500, the LAN9500 CEB must be configured for external PHY operation.

Note 4.2 JP5 and JP7 must always be connected in the same positions (i.e. 1-2 and 1-2, or 2-3 and 2-3 only).

Chapter 5 Software Support

To support developers during every phase of development, SMSC provides various device drivers, customizable applications, and manufacturing/diagnostics tools. This chapter serves as a brief introduction to the software support provided by SMSC. For complete details, refer to the “LAN9500/LAN9500i Software Users Manual”.

5.1 Device Driver Support

LAN9500/LAN9500i software drivers are available for the following operating systems:

- Windows XP 32/64-bit
- Windows Vista 32/64-bit
- Mac OSX 10.5
- Linux (Kernel 2.6.12 or greater)
- Windows CE 5.0/6.0 (.x86 platform)

5.1.1 Device Driver Installer for PC

SMSC is currently developing a customizable installation tool that will allow configuration of logos, strings, and localization, providing name recognition and added value to the end user.

5.2 Manufacturing and Diagnostic Tools

SMSC provides manufacturing and diagnostic tools to aid the production and manufacturing phase of product development.

The manufacturing tool allows users to easily create an EEPROM content file and program the EEPROM on a Windows XP platform. This tool allows the developer to customize the MAC address, serial number, Vendor ID, Product ID, bus-powered or self-powered selection, etc. It also allows developers to select the programmable EEPROM size, allowing more information to be stored on-board. Additionally, EEPROM programming can be configured to occur automatically when a board is connected to the PC, saving time and increasing production throughput.

The diagnostics tool allows the developer to debug and run a network functional test to verify the quality of the board during production. The diagnostics tool keeps a log file and provides an on-screen display of the results for each tested board. This tool runs on the Windows XP platform and may be used with the LAN9500 CEB. No additional equipment is required.

Chapter 6 Related Technical Resources

Table 6.1 details the availability of developer resources for the LAN9500/LAN9500i. These resources may be obtained through either the SMSC website, a customer E-Services account, or by contacting your local SMSC office, as indicated in Table 6.1. Please visit the LAN9500/LAN9500i product page on the SMSC website for additional information: <http://www.smSC.com/main/catalog/lan9500.html>

Table 6.1 LAN9500/LAN9500i Technical Resources

| LAN9500/LAN9500i TECHNICAL RESOURCE | TYPE | AVAILABILITY |
|--|-------------|----------------------|
| LAN9500/LAN9500i Product Introduction | Document | www.smSC.com |
| LAN9500/LAN9500i Data Brief | Document | www.smSC.com |
| LAN9500/LAN9500i Datasheet | Document | www.smSC.com |
| LAN9500/LAN9500i Customer Reference Schematic | Schematic | www.smSC.com |
| LAN9500/LAN9500i Customer Reference Schematic BOM | BOM | www.smSC.com |
| LAN9500/LAN9500i USB-to-LAN Application Layout Guide | Document | Available on request |
| MAC-to-MAC Application Note | Document | Available on request |
| Magneticless PHY-to-PHY Application Note | Document | Available on request |
| LAN9500 CEB Reference Schematic | Schematic | Available on request |
| LAN9500 CEB with MII Interface Reference Schematic | Schematic | Available on request |
| LAN9500 CEB PCB File | PCB | Available on request |
| LAN9500 CEB with MII Interface PCB File | PCB | Available on request |
| LAN9500 CEB Gerber File | Gerber | Available on request |
| LAN9500 CEB with MII Interface Gerber File | Gerber | Available on request |
| LAN9500 CEB BOM | BOM | Available on request |
| LAN9500 CEB with MII Interface BOM | BOM | Available on request |
| LAN9500/LAN9500i IBIS Model | IBIS | Available on request |
| LAN9500/LAN9500i RoHS Report | Report | www.smSC.com |
| LAN9500/LAN9500i Reliability Report | Report | Available on request |
| LAN9500/LAN9500i Performance Test Report | Report | Available on request |
| LAN9500/LAN9500i WinXP Manufacturing and Diagnostics Tools | Software | Available on request |
| LAN9500/LAN9500i Software User Manual | Document | E-Services |
| LAN9500/LAN9500i Vista 64-bit Driver and Installer | Software | E-Services |
| LAN9500/LAN9500i Vista 32-bit Driver and Installer | Software | E-Services |
| LAN9500/LAN9500i WinXP 64-bit Driver and Installer | Software | E-Services |
| LAN9500/LAN9500i WinXP 32-bit Driver and Installer | Software | E-Services |
| LAN9500/LAN9500i Mac OSX 10.5 Driver and Installer | Software | E-Services |
| LAN9500/LAN9500i Linux Driver (Kernel 2.6.12 and greater) | Source Code | E-Services |
| LAN9500/LAN9500i WinCE 5.0/6.0 Driver (.x86 Platform) | Source Code | E-Services |



Chapter 7 Frequently Asked Questions

1. Do I need two clock sources for the USB and Ethernet subsystems of the LAN9500/LAN9500i?

No, only one 25MHz clock source is needed.

2. Where can I obtain the latest LAN9500/LAN9500i drivers and supporting documentation?

Please visit the SMSC LAN9500/LAN9500i product webpage:

<http://www.smsc.com/main/catalog/lan9500.html>

Additional advanced information can be obtained through a free E-Services account. To create a free E-Service account, visit the SMSC E-Services webpage:

<https://www2.smsc.com/main.nsf>

3. Do I need an EEPROM to implement my LAN9500/LAN9500i applications?

No. An EEPROM is not required due to the LAN9500/LAN9500i's ability to be configured using straps and in-band USB vendor commands. However, use of an EEPROM is suggested. The EEPROM contains important register setup information, including the Ethernet MAC address and the USB VID/PID. The USB VID/PID is only programmable through the EEPROM.

4. How do I obtain my own USB Vendor ID and Ethernet MAC ID?

A USB Vendor ID may be obtained from the USB-Implementer Forum:

<http://www.usb.org/developers/vendor/>

An Ethernet MAC address block can be obtained from the IEEE Standards Association:

<http://standards.ieee.org/regauth/oui/forms/>

5. What is LANCheck and how do I use it?

SMSC's LANCheck Online Review is a personalized, value-added service exclusive to SMSC and available at no charge to customers who have selected our Ethernet offerings for their application design-in. LANCheck will support your design process by providing guidance through the complete design cycle - from initial schematic design to PCB design.

To use LANCheck, ask your local SMSC FAE or access it directly on the internet:

https://www2.smsc.com/mkt/web_lancheck.nsf

6. How do I get additional technical support if I need it?

If you have a question that cannot be answered using our supporting documentation, please contact your local SMSC FAE or request support through our website:

<https://www2.smsc.com/mkt/intforms.nsf/faemail>