

## Matrix-510 Linux-ready ARM9 Embedded Computer

- ✓ 100% Linux 2.6.x compatible computing platform
- ✓ 64MB SDRAM and 16MB Flash
- ✓ Ultra-low power consumption, less than 3 Watts
- ✓ Two 10/100Mbps Ethernet ports
- ✓ Eight 921.6Kbps high speed TTY (serial ) ports
- ✓ Two USB 2.0 host ports for add-on functionality expansion
- ✓ One SD memory card slot inside for storage expansion
- ✓ Twenty-one TTL-level digital I/Os (GPIO)
- ✓ One audio out supporting mp3 and wav format
- ✓ GNU C/C++ tool chain for Linux/Windows environment



### Introduction

The Matrix-510 is a mini-mighty Linux-ready ARM9-based computing platform for embedded headless run-only application. It comes equipped with two Ethernet, eight TTY (serial) ports, two USB host ports, plus one internal SD memory card slot and twenty-one TTL-level GPIOs in an incredible small package measuring only 160x104x32 mm.

#### ✘ 100% Linux Compatible , Hassle Free

The Matrix-510 is a true Linux computing platform and it supports versatile file systems. Users can operate the Matrix-510 the same way as they do on a normal Linux desktop.

#### ✘ Support Wire and Wireless Networking

The Matrix-510 comes with two standard 10/100Mbps Ethernet ports for wired networking. In addition, it is easy to add IEEE-802.11b/g WiFi support by simply plugging an USB WiFi dongle into the Matrix-510.

#### ✘ Eight High Speed TTYs (Serial Interface)

Also, the Matrix-510 provides eight 921.6Kbps high-speed TTY ports. Port 1,5,6,7 and 8 can be configured as RS-232, RS-422 or RS-485. Port 2,5,6,7,8 features full RS-232 supporting for modem connection. Port 3 and Port 4 support standard RS-232s.

#### ✘ Twenty-one TTL-level GPIOs

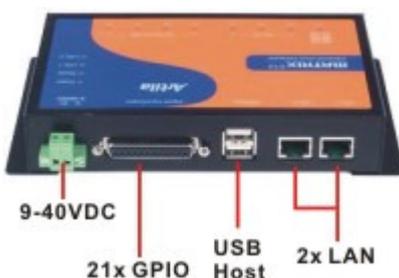
The Matrix-510 comes with twenty-one TTL-level digital I/Os. Each pin can be individually programmed as input or output.

#### ✘ Optional 2GB SD Card for Data Storage

Users can install one standard SD Flash memory card, up to 2GB now, into the Matrix-510 as an additional hard drive.

#### ✘ GNU Tool Chain for Application Development

Open-source GNU Tool Chain, including C/C++ cross-compiler and POSIX standard C/C++ library, is bundled with the Matrix-510 for free.



## H/W Specifications

### CPU/Memory

- ▶ CPU: ATMEL 180MHz AT91RM9200 (ARM9, w/MMU)
- ▶ Memory: 64MB SDRAM, 16MB Flash

### Network Interface

- ▶ No. of ports: two
- ▶ Type: 10/100BaseT, RJ-45 connector
- ▶ Protection: 1.5KV magnetic isolation

### TTY (Serial) Ports

- ▶ Port 1,5,6,7,8: can be set as RS-232, RS-422, or RS-485
- ▶ Port 2,3,4: RS-232
- ▶ Port 2,5,6,7,8: supports full modem signals
- ▶ Connector: RJ45 connector

### TTY (Serial) Port Parameters

- ▶ Baud Rate: up to 921.6 Kbps
- ▶ Parity: None, Even, Odd, Mark, Space
- ▶ Data Bits: 5,6,7,8
- ▶ Stop Bit: 1, 1.5, 2 bits
- ▶ Flow Control: RTS/CTS, XON/XOFF, None

### USB Host Ports

- ▶ No. of ports: two
- ▶ Speed: USB 2.0 compliant, supports low-speed (1.5Mbps) and full-speed (12Mbps) data rate

### Digital I/Os (GPIO)

- ▶ No. of pins: twenty one pins
- ▶ Signal level: TTL compatible
- ▶ Each pin can be programmed as input or output

### Mass Storage

- ▶ One SD 1.0 compliant socket inside

### Audio output

- ▶ support mp3 and wav format

### General

- ▶ WatchDog Timer: yes, for kernel use
- ▶ Real Time Clock: yes
- ▶ Buzzer: yes
- ▶ Power input: 9~40VDC
- ▶ Power consumption: 300mA@12VDC
- ▶ Dimension: 160 x 104 x 32mm
- ▶ Operation Temperature: 0 to 70C(32 to 158F)
- ▶ Regulation: CE Class A, FCC Class A

## S/W Specifications

### General

- ▶ OS: Linux, kernel 2.6.x
- ▶ Boot Loader: U-Boot 1.1.2
- ▶ File Systems: JFFS2, ETX2/ETX3, VFAT/FAT, NFS

### Protocol stacks

- ▶ IPv4, ICMP, ARP, DHCP, NTP, TCP, UDP, FTP, Telnet, HTTP, PPP, PPPoE, CHAP, PAP, SMTP, SNMP V1/V2, SSL, SSH 1.0/2.0

### Utilities

- ▶ bash: shell command
- ▶ tinylogin: login and user manager utility
- ▶ telnet: Telnet client program
- ▶ busybox: Linux utility collection
- ▶ ftp: FTP client program

### Daemon

- ▶ pppd: Dial In/out over serial port and PPPoE
- ▶ snmpd: SNMP agent program
- ▶ telnetd: Telnet server program
- ▶ inetd: TCP server program
- ▶ ftpd: FTP server program
- ▶ boa: Web server program
- ▶ sshd: secured shell server
- ▶ iptables: Firewall service manager
- ▶ armd: Artila manager daemon

### Tool Chain for Linux

- ▶ GCC: C/C++ PC cross compiler for Linux, CygWin
- ▶ GLIBC: POSIX Library

### Device Drivers

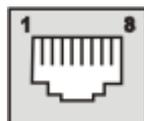
- ▶ SD/MMC, UART, Real Time Clock, Buzzer, Digital I/O, Ethernet, Watchdog Timer

### USB Host Drivers (could be customized)

- ▶ Flash disk
- ▶ WiFi (IEEE-802.11b/g)
- ▶ RS-232 adaptors

## TTY Pin Assignment

PIN	RS-232	RS-422	RS-485
1	DSR *	---	---
2	RTS	Tx+	Data+
3	GND	GND	GND
4	Tx	Tx-	Data-
5	Rx	Rx+	---
6	DCD *	Rx-	---
7	CTS	---	---
8	DTR *	---	---



\* Port 2,5,6,7,8 only

## Ordering Information

### ☒ Matrix-510

ARM9-based Linux Computer with 16MB on-board Flash, including one CD-ROM which contains GNU tool chain and user guide