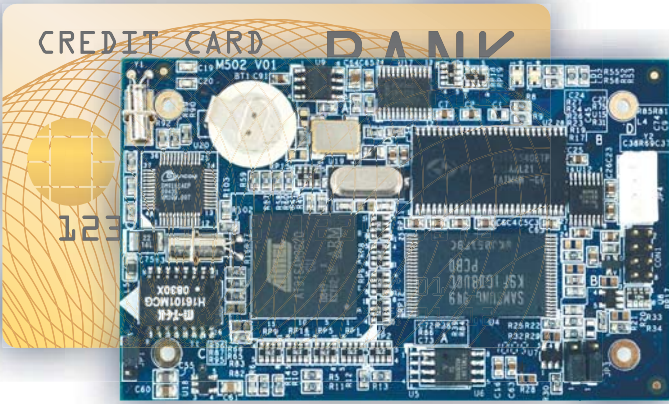


M-502 Industrial ARM9 Linux-based System-on-Module



- ▶ 32 x GPIOs, CMOS/3.3V compatible
- ▶ Compact size, 50 x 80mm only
- ▶ Ultra low power consumption of less than 2.5W
- ▶ GNU C/C++ tool chain is included

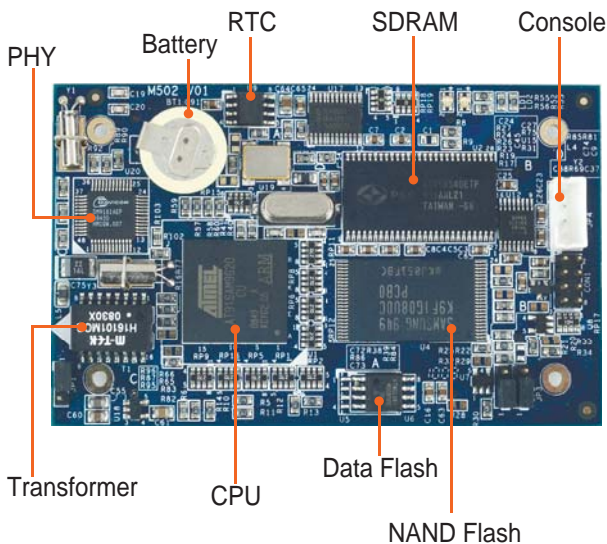
- ▶ ATMEL 400MHz AT91SAM9G20 CPU w/ MMU
- ▶ Linux kernel 2.6.29 with file system
- ▶ 64MB SDRAM/128MB NAND Flash
- ▶ 2MB DataFlash for system recovery
- ▶ On-board real-time clock w/ backup battery
- ▶ 1 x 10/100Mbps Ethernet
- ▶ On-board Ethernet PHY/transformer
- ▶ 2 x USB 2.0 Hosts supporting full speed of 12Mbps
- ▶ 1 x SD (secure digital) interface
- ▶ 4 x 921.6Kbps UARTs w/ hardware flow control
- ▶ I2C Interface
- ▶ I2S Interface, one transmitter and one receiver
- ▶ SPI w/ 2 x chip select signals



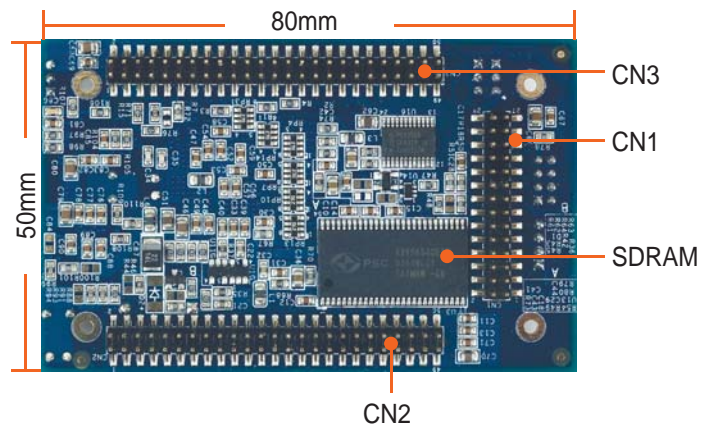
Overview

M-502 is a credit card size ARM9 Linux-based System on Module (SoM). M-502 is powered by 400MHZ ARM926EJ-S ARM Thumb Processor with memory management unit, and equipped with 64MB SDRAM, 128MB NAND Flash, and 2MB DATAFlash. M-502 is also pre-installed with Linux 2.6.29 OS, busybox utility collection, lighttpd Web server, and various hardware device drivers. M-502 comes with one 10/100Mbps Ethernet, two USB 2.0 hosts, four UARTs with hardware/software flow control, and 32 programmable digital I/Os. In addition, Secure Data Card (SD) interface, Serial Peripheral Interface (SPI), Inter-IC(I2C) bus, Inter-IC Sound (I2S) bus, and 8-bit local bus are included. M-502 is a reliable SoM to be used in various embedded systems. It is ideal for all kinds of industrial applications, including intelligent transportation system (ITS), building automation, energy-saving system, and scenario control systems.

Front View of M-502



Back View of M-502



Hardware Specifications

CPU/Memory

CPU: ATMEL 400MHz AT9SAM9G20 w/MMU
SDRAM: 64MB
NAND Flash: 128MB
DataFlash®: 2MB, for system backup

Network Interface

Type: Ethernet, 10/100Mbps
PHY: DAVICOM DM9161
Protection: 1.5KV magnetic isolation

UART

Port 0: TXD0, RXD0, RTS0, CTS0, GND
Port 1: TXD1, RXD1, RTS1, CTS1, DCD1, DTR1, DSR1, GND
Port 2: TXD2, RXD2, RTS2, CTS2, GND
Port 3: TXD3, RXD3, RTS3, CTS3, GND
Signal Level: CMOS/3.3V compatible

Common UART Parameters

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

UART Advanced Feature (when used as RS-485)

Supports 9-bit Multi-drop mode
Supports hardware auto direction control

USB Ports

Hosts: Two, USB 2.0 compliant
Host Signals: UdataA+, UdataA-, UdataB+, UdataB-
Device (Client): One, USB 2.0 compliant
Device (Client) Signals: Uddata+, Uddata-, Udio

I2C (Inter-IC Bus)

Signals: TWD, TWCK
Supported Devices: (driver has been built-in)

I2S (Inter-IC Sound)

Transmitter Signals: TSCK, TWS, TSD
Receiver Signals: RSCK, RWS, RSD

SPI (Serial Peripheral Interface)

Signals: MISO, MOSI, SPCK, CS1, CS2

SD (Secure Digital Card Interface)

Signals: MCCDA, MCCK, MCDA0-MCDA3
Compatible with SD memory card Specification 1.0

Watchdog Timer

CPU built-in internal watchdog timer, used by Linux kernel
Additional watchdog timer is available for user applications

General-Purpose IOs (GPIO)

32 x GPIOs can be programmed as digital input or output
Supports interrupt function when GPIOs are set as digital input
Signal Level: CMOS/3.3V compatible

Pre-defined Pins

Reset Button (CN2, pin#35), input
Buzzer (CN2, pin#37), output
2-pin DIP SW (CN2, pin#12,#13), input
System ready LED (CN2, pin#38), output
LAN activity LED (CN3, pin#11), output

Real Time Clock

Chip: ST M41T81
Backup Battery: Lithium, 48mAh

Debug Ports

JTAG Port: for low level debug
Console Port: RS-232(Tx/Rx) serial console

Local Bus

Data Bus: 8-bit (D0-D7)
Address Bus: 8-bit (A0-A7)
Chip Select: x 4 (CS0, CS5, CS6)
Control Bus: RD, WR
Signal Level: CMOS/3.3V Compatible

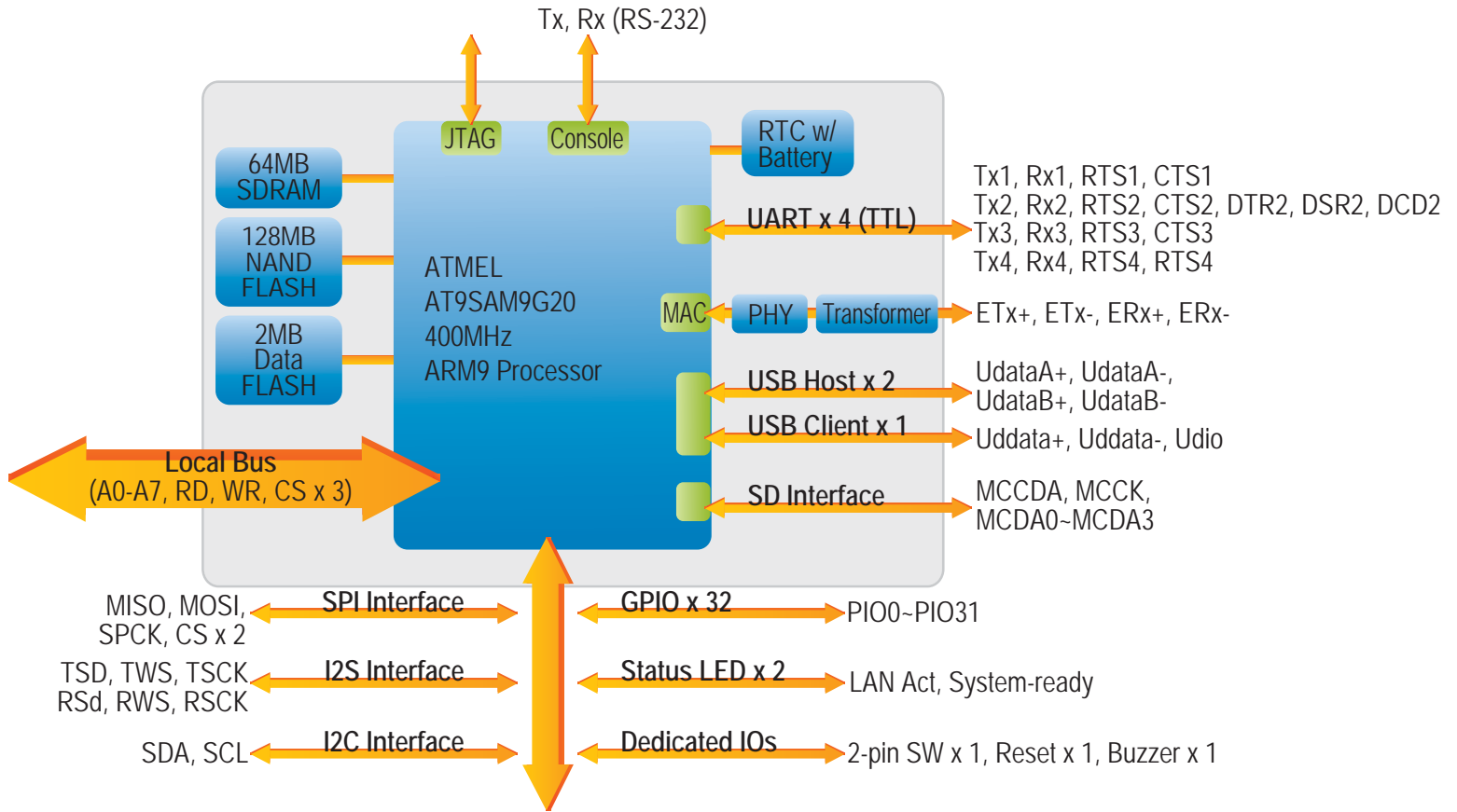
Power Consumption

Input range: 3.0 to 3.6VDC (3.3V nominal)
Consumption: 2W

Power Consumption

Board Dimension: 50 x 80mm
2.0mm pitch Connectors
CN1: 28 pins; CN2: 50 pins; CN3: 50 pins
Mounting Holes: x 4, 2.0mm (M2) in diameter

Block Diagram



Software Specifications

General

OS: Linux, Kernel 2.6.29
 Boot Loader: U-Boot 1.3.4
 File Systems: UBI, JFFS2, ETX2/ETX3, VFAT/FAT, NFS

Pre-installed Utilities

bash, busybox, sysvinit, wget, ipkg, procps (for webmin), psmics, lighttpd, vsftpd, iptable, ppp, ssh, wireless_tools, util-linux-mount/umount, usbtutils, Artila utility. (More utilities can be found in the product CD.)

Daemons Started by Default

ssh (secured shell) with sftp
 syslog/klogd (system and kernel log)
 telnet server (disable root with/etc/security)
 ftp server (vsftpd)
 Web server (lighttpd)
 amgrd (Artila broadcast search daemon)

Package Management & System Administration

Supports ipkg to manage the package installation, upgrade and removal
 Supports webmin (use ipkg install webmin to install) for web-based system administration

Tool Chain for Linux

GCC: C/C++ PC cross compiler
 GLIBC: POSIX Library

Standard Device Drivers

Real Time Clock, SD/MMC, UART, Ethernet, GPIO, Buzzer
 EEPROM: supports ATMEL AT24C16 and its compatibles

Pre-load USB Host Drivers (customizable)

Flash thumb disk
 IEEE-802.11b/g WiFi adapter (Ralink rt73usb, Ralink rt2500usb, Realtek RTL8187, ZyDAS zd1211rw)
 10/100Mbps Fast Ethernet adapter (RT8150)
 RS-232 adapter (prolific PL-2303)
 ADSL modem
 ISDN modem (CDC/ACM compatible)

PIN Assignments

		CN1			
(Addr Bus)	A0	1	2	D0	(Data Bus)
(Addr Bus)	A1	3	4	D1	(Data Bus)
(Addr Bus)	A2	5	6	D2	(Data Bus)
(Addr Bus)	A3	7	8	D3	(Data Bus)
(Addr Bus)	A4	9	10	D4	(Data Bus)
(Addr Bus)	A5	11	12	D5	(Data Bus)
(Addr Bus)	A6	13	14	D6	(Data Bus)
(Addr Bus)	A7	15	16	D7	(Data Bus)
(Write Enable)	WR	17	18	RD	(Read Enable)
(USB Device)	Uddata-	19	20	CS5	(Chip Select)
(Chip Select)	CS6	21	22	CS0	(Chip Select)
(USB Device)	Uddata+	23	24	PIO32/IRQ0	(GPIO/IRQ)
(Console)	TX 232	25	26	RX 232	(Console)
	VCC3	27	28	GND	

		CN2			
(COM2)	CTS2	1	2	DSR2	(COM2)
(COM2)	RTS2	3	4	RXD3	(COM3)
(COM3)	TXD3	5	6	CTS3	(COM3)
(COM3)	RTS3	7	8	TXD4	(COM4)
(COM4)	RXD4	9	10	RTS4	(COM4)
(COM4)	CTS4	11	12	SW#0	(DIP SW)
(DIP SW)	SW#1	13	14	PIO16	(GPIO)
(GPIO)	PIO17	15	16	PIO18/CLK	(GPIO)
(GPIO)	PIO19	17	18	PIO20	(GPIO)
(GPIO)	PIO21	19	20	PIO22	(GPIO)
(GPIO)	PIO23	21	22	PIO24	(GPIO)
(GPIO)	PIO25	23	24	PIO26	(GPIO)
(GPIO)	PIO27	25	26	PIO28	(GPIO)
(USB B+)	UdataB+	27	28	UdataB-	(USB B-)
(USB A-)	UdataA-	29	30	UdataA+	(USB A+)
(GPIO)	PIO29	31	32	PIO30	(GPIO)
(GPIO)	PIO31	33	34	RST#0	(System Reset)
(Reset Bln)	RST#1	35	36	Udio	(USB Device)
(Buzzer)	BUZR	37	38	RDY LED	(Ready LED)
(I2S)	TWS	39	40	TSCK	(I2S)
(I2S)	TSD	41	42	RSD	(I2S)
(I2S)	RSCK	43	44	RWS	(I2S)
	GND	45	46	GND	
	GND	47	48	GND	
	VCC3	49	50	VCC3	

		CN3			
	VCC3	1	2	VCC3	
	GND	3	4	GND	
	GND	5	6	GND	
(LAN)	ERX0-	7	8	ERX0+	(LAN)
(LAN)	ETX0-	9	10	ETX0+	(LAN)
(LAN LED)	ACT LED	11	12	MISO	(SPI)
(SPI)	MOSI	13	14	SPCK	(SPI)
(SPI)	NPCSO	15	16	NPCS3	(SPI)
(SD)	MCCK	17	18	MCCDA	(SD)
(SD)	MCDA0	19	20	MCDA1	(SD)
(SD)	MCDA2	21	22	MCDA3	(SD)
(SD)	SDCD	23	24	SDWP	(SD)
(I2C)	TWD	25	26	TWCK	(I2C)
(GPIO)	PIO1	27	28	PIO3	(GPIO)
(GPIO)	PIO4	29	30	PIO5	(GPIO)
(GPIO)	PIO6	31	32	PIO7	(GPIO)
(GPIO)	PIO8	33	34	PIO9	(GPIO)
(GPIO)	PIO10	35	36	PIO11	(GPIO)
(GPIO)	PIO12	37	38	PIO13	(GPIO)
(GPIO)	PIO14	39	40	PIO15/IRQ1	(GPIO)
(GPIO)	PIO0	41	42	PIO2	(GPIO)
(COM1)	TXD1	43	44	RWS	(COM1)
(COM1)	CTS1	45	46	RTS1	(COM1)
(COM2)	DTR2	47	48	TXD2	(COM2)
(COM2)	RXD2	49	50	DCD2	(COM2)

Ordering Information

M-502

ATMEL9G20 + Linux 2.6.29 System on Module with
128MB Flash, 64MB SDRAM

Module Dimensions

