

# **ROCKY-318 386SX SBC**

**User Manual Version 1.1  
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## Table of Contents

<b>1</b>	<b>Introduction .....</b>	<b>4</b>
1.1	Specifications .....	5
1.2	Package Contents .....	6
<b>2</b>	<b>Installation.....</b>	<b>7</b>
2.1	ROCKY-318 Layout.....	7
2.2	CPU Operation Speed Setting .....	7
2.3	System Memory DRAM .....	9
2.4	Watchdog Timer .....	9
2.5	Single 5V Operation .....	10
2.6	DiskOnChip™ Flash Disk .....	10
2.7	Parallel Port Interface .....	11
<b>3</b>	<b>Connection .....</b>	<b>12</b>
3.1	Floppy Disk Drive Connector.....	12
3.2	IDE Disk Drive Connector .....	13
3.3	Parallel Port .....	14
3.4	Serial Ports .....	15
3.5	Keyboard Connector .....	16
3.6	External Switches and Indicators.....	17
3.7	External Power Connector .....	18
3.8	External Speaker .....	19
3.9	PC/104 Connection Bus .....	19
<b>4</b>	<b>AMI BIOS Setup.....</b>	<b>20</b>
4.1	Getting Started.....	20
4.2	Standard CMOS Setup .....	20
4.3	Advanced CMOS Setup .....	21
	<b>Appendix A E<sup>2</sup> Key™ Function .....</b>	<b>22</b>
	<b>Appendix B Watchdog Timer.....</b>	<b>23</b>

# 1 Introduction

Thank you for choosing ROCKY-318 386SX Single Board Computer. ROCKY-318 is an ISA with PC/104 form factor board, equipped with ALI 6117 (including 386SX CPU) and advanced high-performance multi-mode I/O, designed for system manufacturers, integrators, or VARs that want to provide reliable and quality performance at a reasonable price.

An advanced high performance super AT I/O chip SMC FDC37C665 or equivalent chip is used in the ROCKY-318 board. Both on-chip UARTs are compatible with the NS16C550. The parallel port and IDE interface are compatible with IBM PC/AT and XT architecture's, as well as EPP and ECP. The FDC37C665 incorporates sophisticated power control circuitry (PCC). The PCC supports multiple low power down modes.

The most outstanding feature in the ROCKY-318 is built-in PC/104 expansion bus. Based on the PC/104 bus, you can easily install over thousands of PC/104 modules from hundreds of vendors in the world. ROCKY-318 has external power connector that can connect to power supply directly. It is more suitable for your standalone applications.

In addition, ROCKY-318 provides one 72-pin SIMM (Single In-line Memory Module) socket to install a maximum of 32MB memory (single side RAM). The board is also designed with 1MB DRAM on board for OEM customer.

## 1.1 Specifications

ROCKY-318 386SX Single Board Computer provides the following specifications:

Field	Description
System	<p><b>CPU:</b> ALI 6117, includes 386SX CPU</p> <p><b>DMA channels:</b> 7</p> <p><b>Interrupt levels:</b> 15</p> <p><b>Real-time clock/calendar:</b> DS12887/BQ3287 or equivalent chip and quartz oscillator, 128B CMOS memory, powered by lithium battery for over 10 years of data retention.</p>
Memory	<p><b>RAM memory:</b> 512KB to 32MB, only supports single side SIMM.</p> <p><b>Shadow RAM memory:</b> C0000h ~ DFFFFh</p> <p>System BIOS: 0E0000h ~ 0FFFFFFh</p>
Input/Output	<p><b>IDE hard disk drive interface:</b> Supports up to two IDE hard disk drives. Can be disabled by BIOS Setup.</p> <p><b>Floppy disk drive interface:</b> Supports two 2.88 MB, 1.44MB, 1.2MB, 720KB, or 360KB floppy disk drives. Can be disabled by BIOS Setup.</p> <p><b>Two high-speed Series ports:</b> NS16C550 compatible UARTs with send/receive 16-byte FIFOs, data rates are independently programmable from 115.2K baud down to 50 baud. Modem control circuitry.</p> <p><b>Multi-mode Parallel Port:</b></p> <p>Standard mode - IBM PC/XT, PC/AT, PS/2 compatible bi-directional parallel port.</p> <p>Enhanced mode - Enhanced parallel port (EPP) compatible with IEEE 1284 specification.</p> <p>High-speed mode - Microsoft and Hewlett Packard extended capabilities port (ECP), compatible with IEEE</p>

	1248 specification.
Industrial Features	<p><b>Watchdog timer:</b> Can be set by 1,2,10,20,110,or 220 seconds period. Reset or NMI was generated when CPU did not periodically trigger the timer. Your program uses hex 043 and 443 to control the Watchdog and generate a system reset.</p> <p><b>PC/104 expansion bus:</b> A 64-pin and 40-pin, industrial embedded-PC bus standard.</p> <p><b>External power connector:</b> 8-pin male connector (Molex 6410 series compatible).</p> <p><b>Keyboard connector:</b> A 5-pin header on board and 6-pin mini-DIN keyboard connector is located on the mounting bracket.</p>
General	<p><b>Power Consumption:</b> +5V @ 0.9A (40MHz, 4MB RAM).</p> <p><b>Operating Temperature:</b> 0° ~ 60° C (CPU needs Cooler).</p> <p><b>Humidity:</b> 5% ~ 95%, non-condense.</p> <p><b>Dimension:</b> 180mm(W) x 122mm(L), standard AT form factor.</p>

## 1.2 Package Contents

ROCKY-318 package includes the following items:

- a. ROCKY-318 386SX Single Board Computer x 1
- b. Printer Cable x 1
- c. FDD/HDD Cable x 1
- d. User Manual x 1

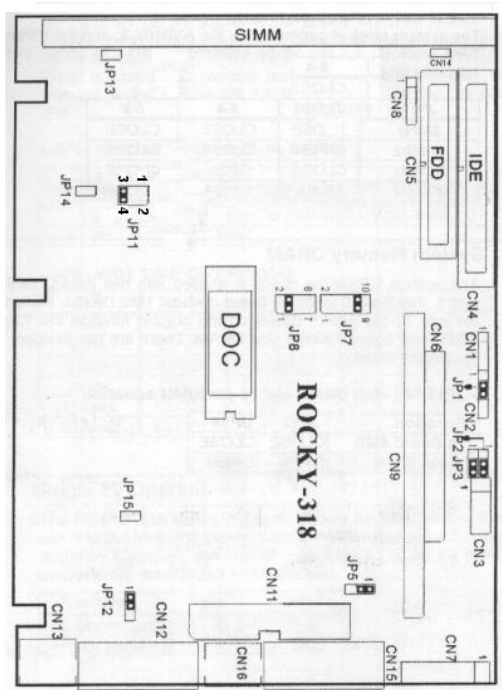
If any of these items is missing or damaged, contact the dealer from whom you

purchase the product. Save the shipping materials and carton in case you want to ship or store the product in the future.

## 2 Installation

This chapter describes how to install the ROCKY-318. The layout of ROCKY-318 is shown on the next page. The jumpers and switches setting for the ROCKY-318's configuration, such as CPU type selection, system clock setting, and interrupt IRQ setting for serial ports and parallel port, are also included.

### 2.1 ROCKY-318 Layout



### 2.2 CPU Operation Speed Setting

- **JP11: CPU Speed Setting:**

The system clock is generated by the AV9107-3, and the different CPU clock frequency can be selected by JP11 and shown as following table:

JP11	1-2	3-4
25MHz	CLOSE	CLOSE
33Mhz	OPEN	OPEN

40MHz	CLOSE	OPEN
-------	-------	------



## 2.3 System Memory DRAM

The system DRAM on board is divided into two banks, bank 0 and 1. The Bank 0 is the on board optional 2/4MB DRAM. Bank 1 is the one 72-pin SIMM. Based on the chipset function the 72-pin SIMM only support single side DRAM. There have two jumpers for the related setting.

- **JP13/14: 2/4MB DRAM and 72-pin SIMM Selection**

Function	JP13	JP14
On Board 2/4MB	CLOSE	CLOSE
72-pin SIMM	OPEN	OPEN

## 2.4 Watchdog Timer

Watchdog Timer is enabled by reading port 443H. It should be triggered before the time-out period ends, otherwise it will assume the program operation is abnormal and will issue a reset signal to start again, or activate NMI to CPU.

Watchdog Timer is disabled by reading port 043H. The time-out period can be set as 1, 2, 10, 20,110 or 220 seconds by jumper JP8.

- **JP1: Watch-Dog Active Type Setting**

JP1	Description
2-3	RESET WHEN WDT TIME-OUT
1-2	ACTIVATE NMI TO CPU WHEN WDT TIME-OUT
OPEN	DISABLE WDT

- **JP8: WDT Time-out Period**

JP8	1-2	3-4	5-6	7-8
1 sec	OPEN	OPEN	CLOSE	OPEN
2 sec	OPEN	OPEN	CLOSE	CLOSE
10 sec	OPEN	CLOSE	OPEN	OPEN
20 sec	OPEN	CLOSE	OPEN	CLOSE
110 sec	CLOSE	OPEN	OPEN	OPEN
220 sec	CLOSE	OPEN	OPEN	CLOSE

## 2.5 Single 5V Operation

ROCKY-318 allows single 5V supply for RS-232 operation or use +/-12V from PC power supply. To use single 5V operation, enable the onboard 5V to +/-12V converter for the RS-232 +/-12V need.

Function	JP5	JP12
5V operation	1-2	1-2
+/-12V need	2-3	2-3

## 2.6 DiskOnChip™ Flash Disk

The DiskOnChip™ Flash Disk Chip (DOC) is produced by M-Systems. The DOC (MD-2200-xMB) is 32-pin DIP package. It is 100% compatible to hard disk and DOS. Customer doesn't need any extra software utility. It is just "plug and play", easy and reliable. Right now the DOC is available in 2MB to 72MB capacity. A PROMDISK-Chip™ also can be used with the same socket.

- **JP7: DiskOnChip™ Memory Address Setting**

Address	1-2	3-4	5-6	7-8	9-10
C8000	CLOSE	OPEN	OPEN	OPEN	OPEN
D0000	OPEN	CLOSE	OPEN	OPEN	OPEN
D8000	OPEN	OPEN	CLOSE	OPEN	OPEN
E0000	OPEN	OPEN	OPEN	CLOSE	OPEN
E8000	OPEN	OPEN	OPEN	OPEN	CLOSE

## 2.7 Parallel Port Interface

ROCKY-318 allows installation of up to three different I/O ports. These three ports are called: LTP1, LTP2, LTP3 with port address at 3BCH~3BEH, 378H~37FH and 278H~27FH, respectively.

- **JP3: Parallel Port Data Request Setting**

JP3	Description
1-2	DRQ1
2-3	DRQ3

- **JP2: Parallel Data Acknowledge for ECP Mode**

JP2	Description
1-2	DACK1
2-3	DACK3

- **JP3: Parallel Port Mode Select**

JP4	Description
3-5 CLOSE 4-6 CLOSE	SPP, EPP
1-3 CLOSE 2-4 CLOSE	ECP+EPP

### 3 Connection

This chapter describes how to connect peripherals, switches and indicators to the ROCKY-318 board. You can access most of the connectors from the top of the board while it is installed in the chassis.

#### 3.1 Floppy Disk Drive Connector

ROCKY-318 board is equipped with a 34-pin daisy-chain driver connector cable. The detailed pin assignment of the connector is specified as following table:

- **CN5: FDC Connector**

<b>PIN</b>	<b>Description</b>	<b>PIN</b>	<b>Description</b>
1	GROUND	2	REDUCE WRITE CURRENT#
3	GROUND	4	N/C
5	GROUND	6	N/C
7	GROUND	8	INDEX#
9	GROUND	10	MOTOR ENABLE A#
11	GROUND	12	DRIVE SELECT B#
13	GROUND	14	DRIVE SELECT A#
15	GROUND	16	MOTOR ENABLE B#
17	GROUND	18	DIRECTION#
19	GROUND	20	STEP#
21	GROUND	22	WRITE DATA#
23	GROUND	24	WRITE GATE#
25	GROUND	26	TRACK 0#
27	GROUND	28	WRITE PROTECT#
29	GROUND	30	READ DATA#
31	GROUND	32	SIDE 1 SELECT#
33	GROUND	34	DISK CHANGE#

### 3.2 IDE Disk Drive Connector

You can attach two IDE (Integrated Device Electronics) hard disk drives to the ROCKY-318 internal controller. The board is equipped with a 40-pin flat-cable connector. The detailed pin assignment of the connector is specified as following table:

- **CN4: IDE Interface Connector**

PIN	Description	PIN	Description
1	RESET#	2	GROUND
3	DATA 7	4	DATA 8
5	DATA 6	6	DATA 9
7	DATA 5	8	DATA 10
9	DATA 4	10	DATA 11
11	DATA 3	12	DATA 12
13	DATA 2	14	DATA 13
15	DATA 1	16	DATA 14
17	DATA 0	18	DATA 15
19	GROUND	20	N/C
21	N/C	22	GROUND
23	IOW#	24	GROUND
25	IOR#	26	GROUND
27	N/C	28	BALE - DEFAULT
29	N/C	30	GROUND - DEFAULT
31	INTERRUPT	32	IOCS16#-DEFAULT
33	SA1	34	N/C
35	SA0	36	SA2
37	HDC CS0#	38	HDC CS1#
39	HDD ACTIVE#	40	GROUND

### 3.3 Parallel Port

This port is usually connected to a printer. ROCKY-318 includes an on-board parallel port, accessed through a 26-pin flat-cable connector CN11. The detailed pin assignment of the connector is specified as following table:

- **CN11: Parallel Port Connector**

<b>PIN</b>	<b>Description</b>	<b>PIN</b>	<b>Description</b>
1	STROBE#	2	DATA 0
3	DATA 1	4	DATA 2
5	DATA 3	6	DATA 4
7	DATA 5	8	DATA 6
9	DATA 7	10	ACKNOWLEDGE
11	BUSY	12	PAPER EMPTY
13	PRINTER SELECT	14	AUTO FORM FEED #
15	ERROR#	16	INITIALIZE
17	PRINTER SELECT LN#	18	GROUND
19	GROUND	20	GROUND
21	GROUND	22	GROUND
23	IOW#	24	GROUND
25	GROUND		

### 3.4 Serial Ports

ROCKY-318 offers two high speed NS16C550 compatible UARTs with Read/Receive 16 byte FIFO serial ports. These ports let you connect to serial devices or a communication network. Two DB-9 connectors are provided by ROCKY-318. The detailed pin assignment of the connectors are specified as following tables:

- **CN12 & CN10: Serial Port Connector (ACE0 & ACE1)**

<b>PIN</b>	<b>Description</b>
1	DATA CARRIER DETECT (DCD)
2	RECEIVE DATA (RXD)
3	TRANSMIT DATA (TXD)
4	DATA TERMINAL READY (DTR)
5	GROUND (GND)
6	DATA SET READY (DSR)
7	REQUEST TO SEND (RTS)
8	CLEAR TO SEND (CTS)
9	RING INDICATOR (RI)

### 3.5 Keyboard Connector

ROCKY-318 provides two keyboard connectors. A 5-pin header connector CN3 supports passive backplane applications. Another one is a 6-pin Mini-DIN connector CN13 on the board-mounting bracket for single board computer applications. The detailed pin assignment of the connector is specified as following table:

- **CN3: 5-pin Header Keyboard Connector**

PIN	Description
1	KEYBOARD CLOCK
2	KEYBOARD DATA
3	N/C
4	GROUND
5	+5V

- **CN13: 6-pin Mini-DIN Keyboard Connector**

PIN	Description
1	KEYBOARD DATA
2	N/C
3	GROUND
4	+5V
5	KEYBOARD CLOCK
6	N/C



### 3.6 External Switches and Indicators

There are many external switches and indicators for monitoring and controlling your CPU board. These features are completely optional install them if you need them. The detailed pin assignment of the connectors is specified as following table:

- **CN2: Reset Button**

PIN	Description
1	EXTERNAL RESET
2	GROUND

- **CN14: IDE LED Connector**

PIN	Description
1	+5V
2	HDD ACTIVE#

- **CN8: POWER LED & KEYLOCK**

PIN	Description
1	POWER LED ANODE
2	KEY
3	GROUND
4	KEYLOCK
5	GROUND

### 3.7 External Power Connector

ROCKY-318 has an on-board external power connector CN7. You can connect power directly to the CPU board for some single-board-computer (without passive backplane) application.

- **CN7: External Power Connector**

<b>PIN</b>	<b>Description</b>
1	+5V
2	+12V
3	-12V
4	GROUND
5	GROUND
6	-5V
7	+12V
8	+5V

### 3.8 External Speaker

ROCKY-318 has its own buzzer. You also can connect to the external speaker through the connector CN1.

- **CN1: Speaker**

PIN	Description
1	SPEAKER SIGNAL
2	GROUND

### 3.9 PC/104 Connection Bus

The PC/104 expansion bus of ROCKY-318 let you attach any kind of PC/104 modules. The PC/104 bus has already become the industrial embedded PC bus standard, so you can easily install over thousands of PC/104 modules from hundreds of vendors in the world.

**Note:** ROCKY-318 allows direct plug in PC/104 module, PC/104 connection Kit is not needed.

## 4 AMI BIOS Setup

ROCKY-318 use AMI BIOS for system configuration, and the AMI BIOS setup program is designed to provide maximum flexibility in configuring the system by offering various options which may be selected for end-user requirements. This chapter is written to assist you in the proper usage of these features.

### 4.1 Getting Started

When the system is powered on, BIOS will enter Power-On-Self-Test routines. These routines will be executed for System Test and Initialization and System Configuration Verification. After POST routines are completed, the following message will appear:

**" Hit < Del>, if you want to run SETUP"**

To access AMI BIOS Setup program, press <Del> key.

### 4.2 Standard CMOS Setup

Standard CMOS Setup is the first option on the main menu.

The standard CMOS setup utility is used to configure the following features:

- i. Date/Time
- ii. Hard Disk Type
- iii. Floppy Disk Type

All of these features are almost the same as common, so we do not describe more detailed in here.

### 4.3 Advanced CMOS Setup

When you enter Advanced CMOS Setup, this Setup program is equipped with a series of help screens, accessed by <F1> key, which will display the options available for a particular configuration features.

There are a few special items which are specified as below:

- On-board IDE Controller: The IDE hard disk drive can be **Enabled** or **Disabled** by this item. When you do not need hard disk, the IDE controller can be disabled.
- On-board Floppy Controller: The floppy disk drive can be Enabled or Disabled by this item. When you do not need floppy disk, FDD controller can be disabled.
- Serial Port 1: The options are **Disabled**, **3E8**, **2F8**, or **3F8**. You can set the I/O address of the serial port (COMA) or disable it.
- Serial Port 2: The options are **Disabled**, **2E8**, **3F8**, or **2F8**. You can set the I/O address of the serial port 1 (COMB) or disable it.
- Parallel Port: The options are **Disabled**, **3BC**, **378** or **278**. You can set the I/O address of the parallel port or disable it.
- Parallel Port Mode: ROCKY-318 provides EPP, ECP, ECP+EPP, and Normal Mode.
- Primary Display: You could set VGA/EGA, CGA40x25, CGA80x25, Mono or Absent. When set Absent the ROCKY-318 will not check the display adapter when power on the system.
- System Keyboard: You could set Present or Absent. When set Absent the ROCKY-318 will not check the display adapter when power on the system.

## Appendix A E<sup>2</sup> Key™ Function

ROCKY-318 provides an outstanding E<sup>2</sup>KEY™ function for system integrator. Based on the E<sup>2</sup>KEY™ you could free to store the ID Code, Pass Word, or Critical Data in the 1Kbit EEPROM. Because the EEPROM is nonvolatile memory, you don't have to worry the losing of the very important data.

Basically the E2KEY™ is based on a 1Kbit EEPROM which is configured to 64 words (from 0 to 63). You can access (read or write) each word at any time.

When you start to use the E2KEY™ you should have the utility in the package. The software utility will include four files as follows,

**README.DOC**

**E2KEY.OBJ**

**EKEYDEMO.C**

**EKEYDEMO.EXE**

The E2KEY.OBJ provides two-library function for user to integrate their application with E<sup>2</sup>KEY™ function. These libraries (**read\_e2key** and **write\_e2key**) are written and compiled in C format. Please check the following statement, and then you will know how to implement it easily.

**unsigned int read\_e2key(unsigned int address)**

/\* This function will return the E2KEY™'s data at address. The address range is from 0 to 63. Return data is one word,16 bits \*/

**void write\_e2key(unsigned int address,unsigned data)**

/\* This function will write the given data to E<sup>2</sup>KEY™ at address. The address range is from 0 to 63. The data value is from 0 to 0xffff. \*/

To easy start to use the function, please refer the include EKEYDEMO.C code at first.

**Note:** E<sup>2</sup>KEY™ function is based on the working of parallel port. So you should enable the parallel port of ROCKY-318, otherwise it will be not working.

## Appendix B Watchdog Timer

Watchdog Timer is provided to ensure that standalone systems can always recover from catastrophic conditions that caused the CPU to crash. This condition may have occurred by external EMI or a software bug. When the CPU stops working properly, hardware on the board will either perform a hardware reset (cold boot) or a non-maskable interrupt (NMI) to bring the system back to a known state.

Watchdog Timer is controlled by two I/O ports.

443 (hex)	Read	Enable the refresh the Watch-Dog Timer.
043 (hex)	Read	Disable the Watchdog Timer.

To enable Watchdog Timer, a read from I/O port 443H must be performed. This will enable and activate the countdown timer which will eventually time out and either reset the CPU or cause an NMI depending on the setting of JP1. To ensure this reset condition does not occur, Watchdog Timer must be periodically refreshed by reading the same I/O port 443H. This must be done within the time out period that is selected by jumper JP8.

A tolerance of at least 30% must be maintained to avoid unknown routines within the operating system (DOS), such as disk I/O that can be very time consuming. Therefore if the time out period has been set to 10 seconds, the I/O port 443H must be read within 7 seconds.

**Note:** When exiting a program, it is necessary to disable Watchdog Timer, otherwise the system will reset.