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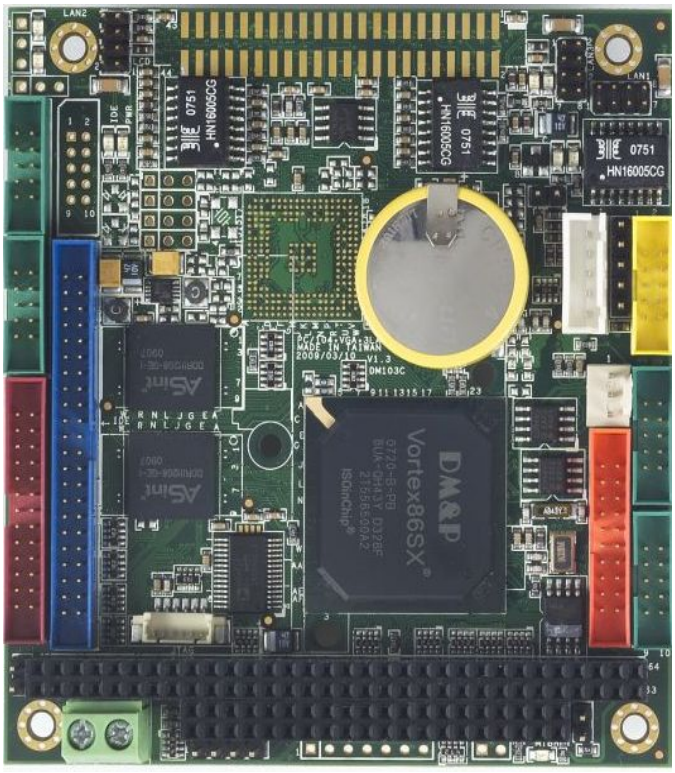
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VSX-6156-V2

DM&P Vortex86SX 300MHz

PC/104 CPU Module

with 4S/2USB/3LAN/GPIO

128MB DDR2 Onboard

User's Manual

(Revision 1.1A)

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Manual No. IUM6156-V2000-01 Ver.1.0A December, 2009
Manual No. IUM6156-V2000-01 Ver.1.1A May, 2010

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Chapter 1

Introduction

1.1 Packing List

Product Name	Package
VSX-6156-V2	• Embedded Vortex86SX CPU All-in-One Board • Manual & Drivers CD x 1 • RS232 cable x 4 • PRINT cable x1 • IDE cable x 1 • USB cable x 1 (USB port x 2) • LAN cable x 3 • GPIO cable x 1 • PS/2 Mouse cable x 1 • PS/2 Keyboard cable x 1 • Screw Kit x 1

1.2 Product Description

The VSX-6156-V2 family of low-power x86 embedded controller is designed to meet PC/104 specification, and integrated with the following features.

- 300MHz Vortex86SX System-On-Chip
- 128 / 256 MB DDR2 system memory
- Enhanced IDE
- 10/100Mbps Ethernet x 3
- 2 USB 2.0 (host)
- Up to 4 serial ports
- Parallel port
- 16-bit GPIOs
- Onboard 2MB SPI Flash
- Meet PC/104 stacking spec.
- 2 watchdog timer
- JTAG interface
- AMI BIOS
- Single voltage +5V DC
- Support extended operating temperature range of -20°C to +70°C

The VSX-6156-V2 PC/104 family of embedded controller is designed with backward compatibility in mind, to provide migration path for projects facing end-of-life challenges with their existing x86 based PC/104 controller. The VSX-6156-V2 family of controller is designed as a plug in replacement, with backward compatibility to support legacy software to help extend existing product life cycle without heavy re-engineering.

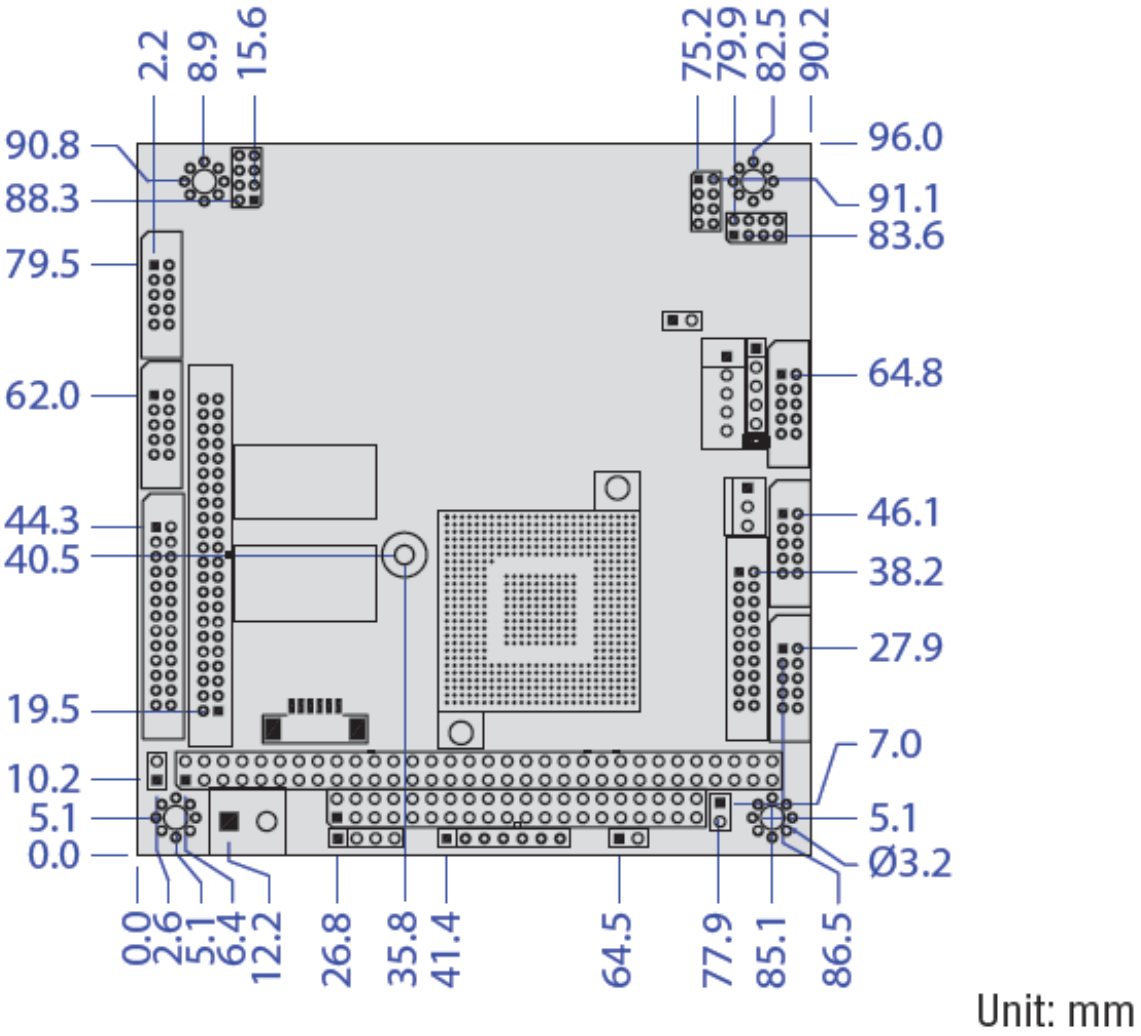
VSX-6156-V2 is suitable for broad range of data-acquisition, Industrial automation, Process control, Automotive controller, AVL, Intelligent Vehicle management devic,Medical device, Human machine interface, Robotics, machinery control And more…application that required small footprint, low-power and low-cost hardware with open industry standard such as PC/104.

1.3 Specifications

Features	VSX-6156-V2
CPU	DM&P SoC CPU Vortex86SX- 300MHz Real Time Clock with Lithium Battery Backup
Cache	L1:16K I-Cache, 16K D-Cache
BIOS	AMI BIOS
Bus Interface	PC/104 Standard Compliant
System Memory	128 / 256MB DDR2 Onboard
Watchdog Timer	Software programmable from 30.5 us to 512 seconds x2 sets(Watchdog 1 fully compatible with M6117D)
LAN	Integrated 10/100M Ethernet Realtek 8100B 10/100Mbps Ethernet Controller Half/Full duplex capability
I /O Interface	• Enhanced IDE port x1 • RS-232 port x3 • RS-232/422/485 port x1 (RS485: Auto Direction) • Parallel port x1 • USB port x2 (USB 2.0 version) • 16-bit GPIO port x1 • 10/100Mbps Ethernet port x3
Connectors	• 2.00 mm ∅ 44-pin box header for IDE x1 • 2.00 mm ∅ 26-pin box header for Print x1 • 2.00 mm ∅ 20-pin box header for 16-bit GPIO x1 • 2.00 mm ∅ 10-pin box header for RS-232 x4 • 2.00 mm ∅ 10-pin box header for USB x1 • 2.00 mm ∅ 8-pin header for LAN x 3 • 2.54 mm ∅ 5-pin box header for Keyboard x1 • 2.54 mm ∅ 4-pin header for DC-in x1 • 2.54 mm ∅ 3-pin header for RS-485 x1 • 2.54 mm ∅ 5-pin header for Mouse x1 • 2.54 mm ∅ 2-pin header for Reset x1 • 2.54 mm ∅ 7-pin header for Redundancy x1(Opt.) • 2.54 mm ∅ 2-pin header for SYS-Fail-SW x1(Opt.) • 1.25 mm ∅ 6-pin Wafer for JTAG x1
Flash Disk Support	• Onboard 2MB SPI Flash Disk (Driver: A) • 44-pin IDE Flash Disk(EmbedDisk 16MB or above)
SRAM support	512KB (Optional)
Power Requirement	Single Voltage +5V @ 440mA
Dimension	90 X 96mm (3.54 x 3.77 inches)

Weight	84g
Operating Temperature	-20°C ~ +70°C -40°C ~ +85°C (Optional)

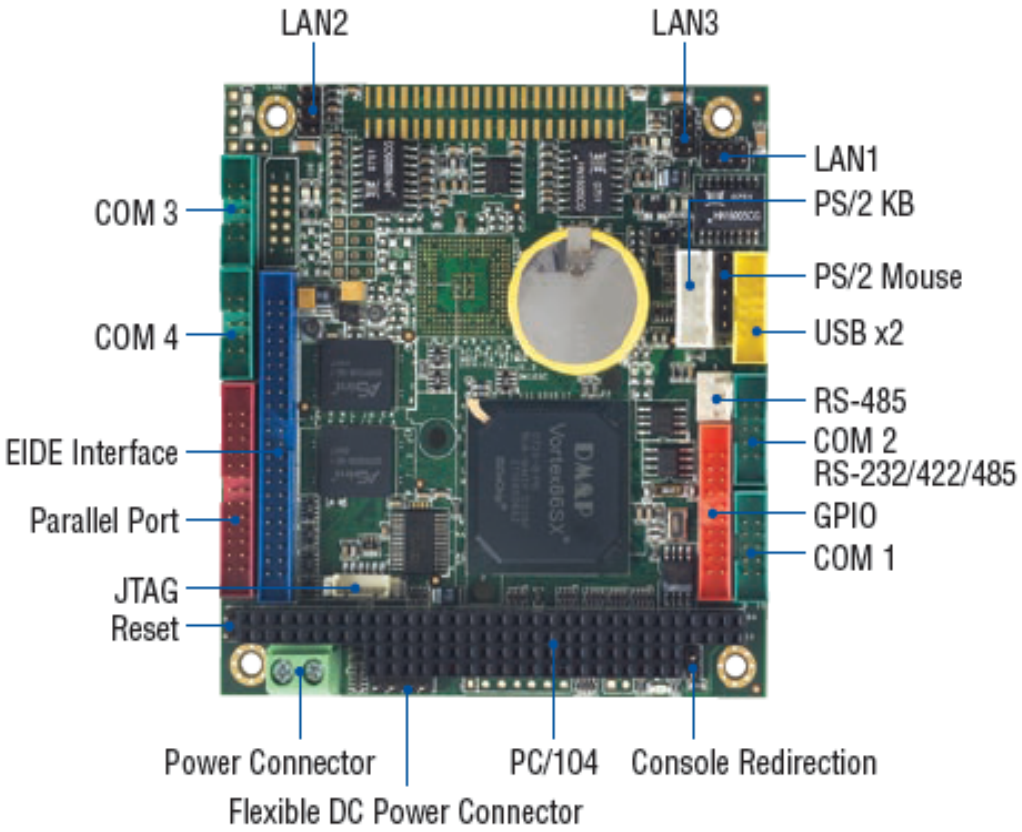
1.4 Board Dimension



Chapter 2

Installation

2.1 Board Outline

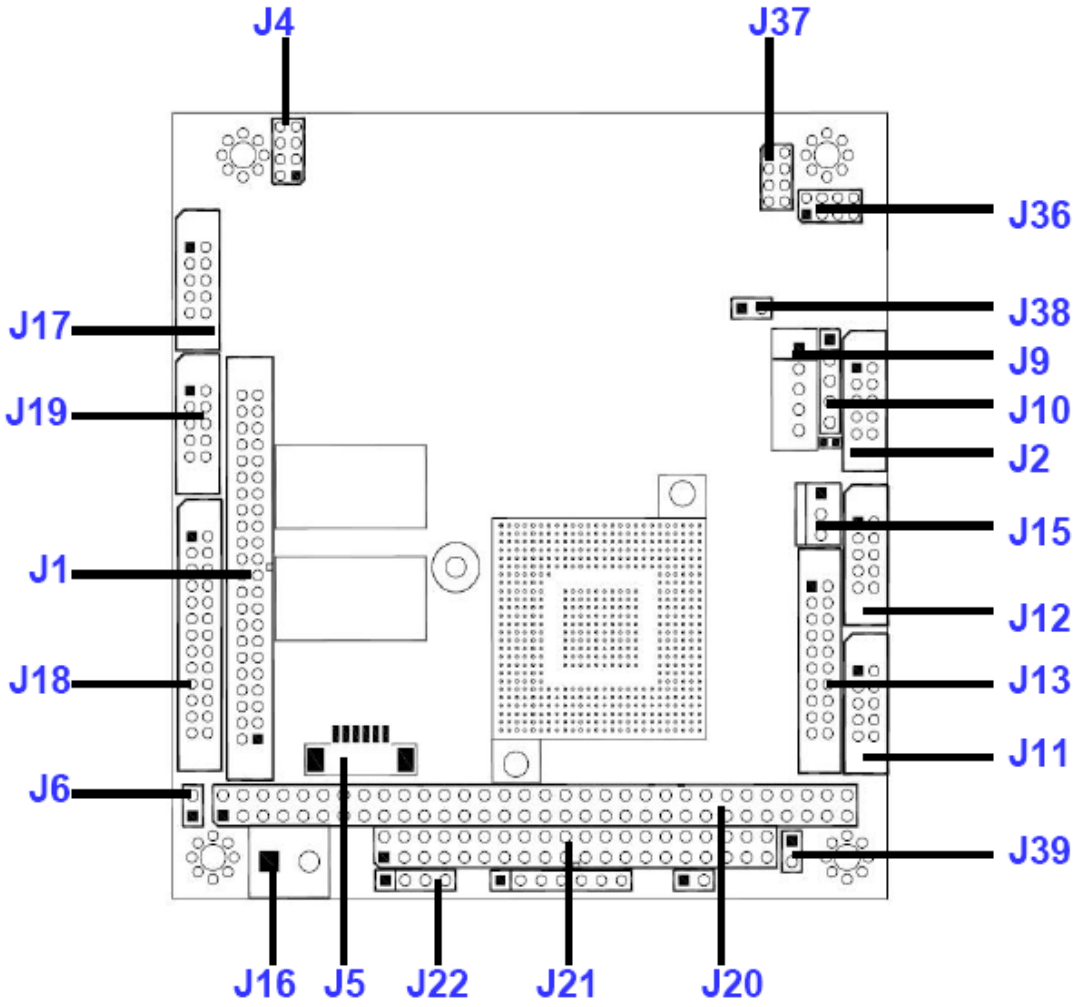


(Note1: COM2 RS232/422/485 is selected by BIOS setting)

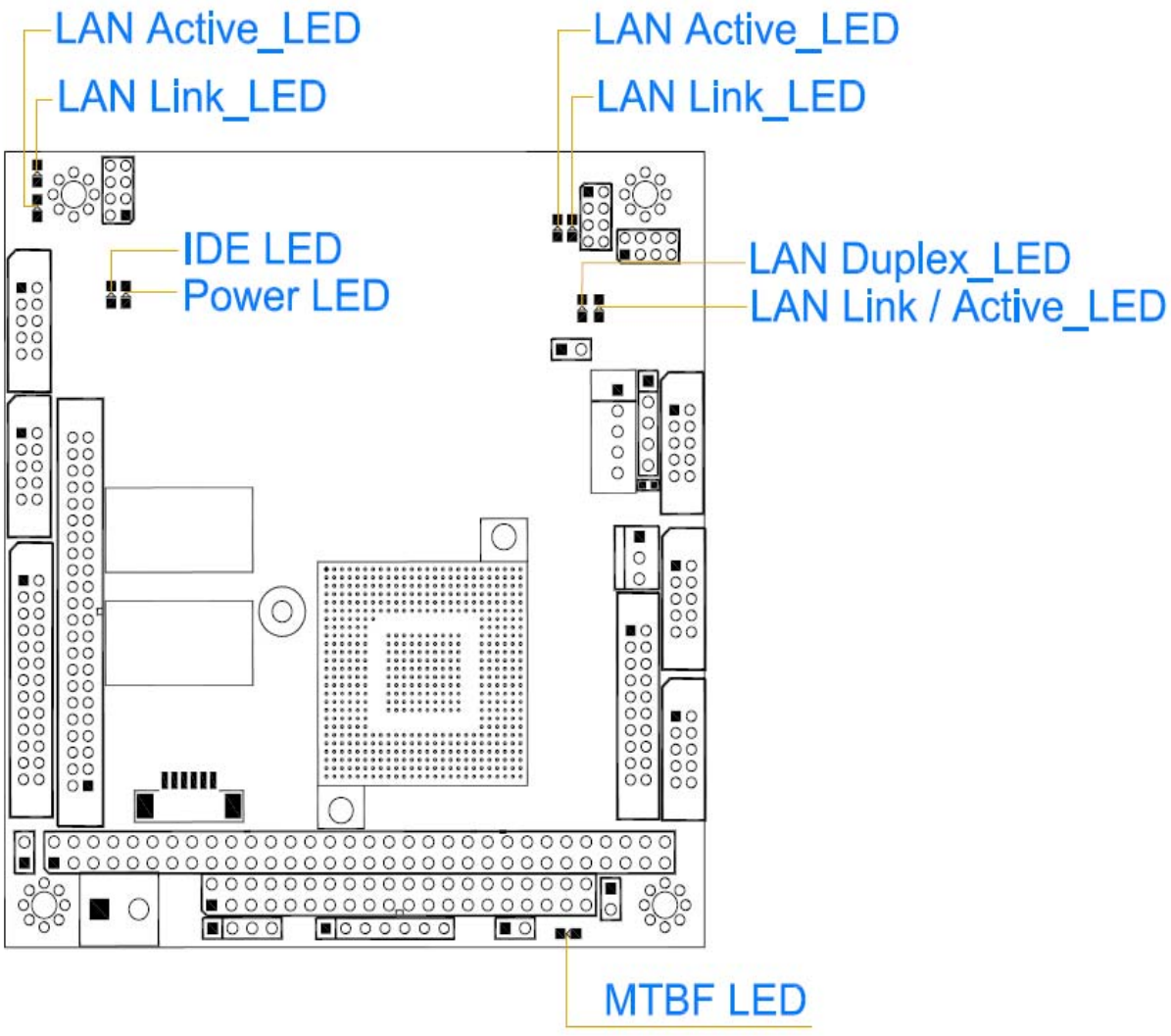
(Note2: Redundancy Signal and System-Fail-SW are optional)

(Note3: COM1/COM2/COM3/COM4 TTL are optional)

2.2 Connectors & Jumpers Location



Jumpers & LEDs



2.3 Connectors & Jumpers Summary

Summary Table

Nbr	Description	Type of Connections	Pin nbrs.
J1	IDE	Box Header, 2.0∅ ,22x2	44-pin
J2	USB	Box Header,2.0∅ , 5x2	10-pin
J4	LAN 1	Pin Header, 2.0∅ , 4x2	8-pin
J5	JTAG	Box Header, 125∅ , 6x1	6-pin
J6	Reset	Pin Header, 2,54∅,1x2	2-pin
J7	Redundancy (Optional)	Pin Header, 2.54∅, 7x1	7-pin
J8	System –Fail-Switch (Optional)	Pin Header, 2.54∅ , 2x1	2-pin
J9	PS/2 Keyboard	Box Header, 2,54∅,1x5	5-pin
J10	PS/2 Mouse	Pin Header, 2,54∅,1x5	5-pin
J11	COM1(GPIO4/TTL Optional)	Box Header, 2.0∅ 5x2	10-pin
J12	COM2(RS232/422/485)	Box Header, 2.0∅ 5x2	10-pin
J13	GPIO (Port 0 / 1)	Box Header, 2.0∅ ,10x2	20-pin
J15	RS-485 (Auto direction)	Molex Header,2.54∅, 3x1	3-pin
J16	Power Connector	Terminal Block 5.0∅,2x1	2-pin
J17	COM3	Box Header, 2.0∅ 5x2	10-pin
J18	PRINT	Box Header, 2.0∅ , 13x2	26-pin
J19	COM4	Box Header, 2.0∅ 5x2	10-pin
J20	PC104 Connector – 64 pin	Box Header, 2.54∅ 32x2	64-pin
J21	PC104 Connector – 40 pin	Box Header, 2.54∅ 20x2	40-pin
J22	4P Power Source (Interconnect to PC/104 – J20)	Pin Header, 2.54∅ , 4x1	4-pin
J36	LAN 2	Pin Header, 2.0∅ , 4x2	8-pin
J37	LAN 3	Pin Header, 2.0∅ , 4x2	8-pin
J38	BUZZER	Pin Header, 2.54∅ , 2x1	2-pin
J39	Console Redirection	Pin Header, 2.54∅ , 2x1	2-pin
PWR-LED	Power Active LED (Red)	LED-SMD	
IDE-LED	IDE Active LED (Green)	LED-SMD	
MTBF-LED	MTBF-Out (Orange)	LED-SMD	
LED 4	LAN Link/Active LED (Green)	LED-SMD	

LED 5	LAN Duplex LED (Yellow)	LED-SMD	
LED 6	LAN Active LED (Green)	LED-SMD	
LED 7	LAN Link LED (Yellow)	LED-SMD	
LED 8	LAN Active LED (Green)	LED-SMD	
LED 9	LAN Link LED (Yellow)	LED-SMD	

2.4 Pin Assignments & Jumper Settings

J1: IDE (44 Pins)

Pin #	Signal Name	Pin #	Signal Name
1	IDERST	2	GND
3	IDED7	4	IDED8
5	IDED6	6	IDED9
7	IDED5	8	IDED10
9	IDED4	10	IDED11
11	IDED3	12	IDED12
13	IDED2	14	IDED13
15	IDED1	16	IDED14
17	IDED0	18	IDED15
19	GND	20	NC
21	IDEREQ	22	GND
23	IDEIOW	24	GND
25	IDEIOR	26	GND
27	ICHRDY	28	GND
29	IDEACK	30	GND
31	IDEINT	32	NC
33	IDESA1	34	IDECBLID
35	IDESA0	36	IDESA2
37	IDECS-0	38	IDECS1
39	IDELED	40	GND
41	VCC	42	VCC
43	GND	44	NC

J2: USB

Pin #	Signal Name	Pin #	Signal Name
1	VCC	2	VCC
3	LUSBD3-	4	LUSBD2-
5	LUSBD3+	6	LUSBD2+
7	GND	8	GND
9	GGND	10	GGND

J4: LAN1

Pin #	Signal Name	Pin #	Signal Name
1	ATX+	2	ATX-
3	ARX+	4	LED0
5	LED0+	6	ARX-
7	LED1+	8	LED1

J5: JTAG

Pin #	Signal Name	Pin #	Signal Name
1	VCC	2	GND
3	TCK	4	TDO
5	TDI	6	TMS

J6: RESET

Pin #	Signal Name	Pin #	Signal Name
1	Reset	2	GND

J7: Redundancy (Optional)

Pin #	Signal Name	Pin #	Signal Name
1	GND	2	SYS-FAIL-OUT
3	SYS-FAIL-IN	4	GPCS0
5	SYS-GPCS-IN	6	TXD9\
7	RXD9\		

J8: Redundancy (System-Fail-Switch) (Optional)

Pin #	Signal Name
1	SYS-SW-IN
2	GND

J9: PS/2 Keyboard

Pin #	Signal Name	Pin #	Signal Name
1	KBCLK	2	KBDAT
3	NC	4	GND
5	VCC		

J10: PS/2 Mouse

Pin #	Signal Name	Pin #	Signal Name
1	MSCLK	2	MSDATA
3	NC	4	GND
5	VCC		

J11: COM 1 (GPIO4/TTL Optional)

Pin #	Signal Name	Pin #	Signal Name
1	DCD1	2	RXD1
3	TXD1	4	DTR1
5	GND	6	DSR1
7	RTS1	8	CTS1
9	RI1	10	NC

J12: COM2 RS232 / 422 / 485 (Optional: TTL)

Pin #	Signal Name	Pin #	Signal Name
1	DCD2/ 422TX- / RS485-	2	RXD2 / 422TX+ / RS485+
3	TXD2 / 422RX+	4	DTR2 / 422RX-
5	GND	6	DSR2
7	RTS2	8	CTS2
9	RI2	10	NC

J13: GPIO (Port 0 / 1)

Pin #	Signal Name	Pin #	Signal Name
1	GND	2	VCC
3	GP00	4	GP10
5	GP01	6	GP11
7	GP02	8	GP12
9	GP03	10	GP13
11	GP04	12	GP14
13	GP05	14	GP15
15	GP06	16	GP16
17	GP07	18	GP17
19	VCC	20	GND

J15: RS485 (Auto direction)

Pin #	Signal Name
1	RS485＋
2	RS485－
3	GND

J16: Power Connector (Terminal Block 5.0mm)

Pin #	Signal Name
1	+5V
2	GND

J17: COM3 (Optional: TTL)

Pin #	Signal Name	Pin #	Signal Name
1	DCD3	2	RXD3
3	TXD3	4	DTR3
5	GND	6	DSR3
7	RTS3	8	CTS3
9	RI3	10	NC

J18: PRINT

Pin #	Signal Name	Pin #	Signal Name
1	STB-	14	AFD-
2	PD0	15	ERR-
3	PD1	16	INIT-
4	PD2	17	SLIN-
5	PD3	18	GND
6	PD4	19	GND
7	PD5	20	GND
8	PD6	21	GND
9	PD7	22	GND
10	ACK-	23	GND
11	BUSY	24	GND
12	PE	25	GND
13	SLCT	26	NC

J19: COM4 (Optional: TTL)

Pin #	Signal Name	Pin #	Signal Name
1	DCD4	2	RXD4
3	TXD4	4	DTR4
5	GND	6	DSR4
7	RTS4	8	CTS4
9	RI4	10	NC

J20: PC104 Connector – 64pin

Pin #	Signal Name	Pin #	Signal Name
1	IOCHCHK *	2	GND
3	SD7	4	RESETDRV
5	SD6	6	VCC
7	SD5	8	IRQ9
9	SD4	10	-5V
11	SD3	12	DRQ2
13	SD2	14	-12V
15	SD1	16	OWS
17	SD0	18	+12V
19	IOCHRDY	20	GND
21	AEN	22	SMEMW *
23	SA19	24	SMEMR *
25	SA18	26	IOW *
27	SA17	28	IOR *
29	SA16	30	DACK3 *
31	SA15	32	DRQ3
33	SA14	34	DACK1 *
35	SA13	36	DRQ1
37	SA12	38	REFRESH *
39	SA11	40	SYSCLK
41	SA10	42	IRQ7
43	SA9	44	IRQ6
45	SA8	46	IRQ5
47	SA7	48	IRQ4
49	SA6	50	IRQ3
51	SA5	52	DACK2 *
53	SA4	54	TC
55	SA3	56	BALE
57	SA2	58	VCC
59	SA1	60	OSC
61	SA0	62	GND
63	GND	64	GND

J21: PC104 Connector – 40pin

Pin #	Signal Name	Pin #	Signal Name
1	GND	2	GND
3	MEMCS16 *	4	SBHE *
5	IOCS16 *	6	SA23
7	IRQ10	8	SA22
9	IRQ11	10	SA21
11	IRQ12	12	SA20
13	IRQ15	14	SA19
15	IRQ14	16	SA18
17	DACK0 *	18	SA17
19	DRQ0	20	MEMR *
21	DACK5 *	22	MEMW *
23	DRQ5	24	SD8
25	DACK6 *	26	SD9
27	DRQ6	28	SD10
29	DACK7 *	30	SD11
31	DRQ7	32	SD12
33	VCC	34	SD13
35	MASTER *	36	SD14
37	GND	38	SD15
39	GND	40	NC

J22: 4P Power Source (Interconnect to PC/104 – J20)

Pin #	Signal Name
1	-5V
2	-12V
3	+12V
4	GND

J36: LAN2

Pin #	Signal Name	Pin #	Signal Name
1	TX+1	2	TX-1
3	RX+1	4	LED01
5	LED01+	6	RX-1
7	LED11+	8	LED11

J37: LAN3

Pin #	Signal Name	Pin #	Signal Name
1	TX+2	2	TX-2
3	RX+2	4	LED02
5	LED02+	6	RX-2
7	LED12+	8	LED12

J39: Console Redirection

Pin #	Signal Name	Pin #	Signal Name
1	Console	2	GND

2.5 System Mapping

System Mapping

Memory Mapping

Address	Description	Usage
0000:0000-9000:FFFF	System RAM	*
A000:0000-A000:FFFF	EGA/VGA Video Memory	
B000:0000-B000:7FFF	MDA RAM, Hercules graphics display RAM	
B000:8000-B000:FFFF	CGA display RAM	
C000:0000-C000:7FFF	EGA/VGA BIOS ROM	
C000:8000-C000:FFFF	Boot ROM enable.	*
D000:0000-D700:FFFF	Expansion ROM space.	
D800:0000-DB00:FFFF	SPI FLASH Emulation Floppy A Enable.	
DC00:0000-DF00:FFFF	Expansion ROM space.	
E000:0000-E000:FFFF	USB Legacy SCSI ROM space.	*
F000:0000-F000:FFFF	Motherboard BIOS	*

I/O Mapping

I/O Address	Owner	Usage
0000h - 000Fh	DMA 8237-1	*
0010h - 0017h	COM 9	*
0018h - 001Fh	Empty	
0020h - 0021h	PIC 8259-1	*
0022h - 0023h	6117D configuration port	*
0024h - 002Dh	Empty	
002Eh - 002Fh	Forward to LPC BUS	*
0030h - 003Fh	Empty	
0040h - 0043h	Timer counter 8254	*
0044h - 0047h	Empty	
0048h - 004Bh	PWM counter 8254	*
004Ch - 004Dh	Empty	
004Eh - 004Fh	Forward to LPC BUS	*
0050h - 005Fh	Empty	
0060h	Keyboard data port	*
0061h	Port B + NMI control port	*
0062h - 0063h	8051 download 4K address counter	*

0064h	Keyboard status port	*
0065h	WatchDog0 reload counter	*
0066h	8051 download 8bit data port	*
0067h	WatchDog1 reload counter	*
0068h - 006Dh	WatchDog1 control register	*
006Eh - 006Fh	Empty	
0070h - 0071h	CMOS RAM port	*
0072h - 0075h	MTBF counter	*
0076h - 0077h	Empty	
0078h - 007Ch	GPIO port 0,1,2,3,4 default setup	*
007Dh - 007Fh	Empty	
0080h - 008Fh	DMA page register	*
0090h - 0091h	Empty	
0092h	System control register	*
0093h - 0097h	Empty	
0098h - 009Ch	GPIO direction control	*
00A0h - 00A1h	PIC 8259-2	*
00A2h - 00BFh	Empty	
00C0h - 00DFh	DMA 8237-2	*
00E0h - 00FFh	Empty	
0100h - 0101h	GPCS1 default setting address	*
0170h - 0177h	IDE1 (IRQ 15)	
01F0h - 01F7h	IDE0 (IRQ 14)	*
0220h - 0227h	COM8 Forward to LPC BUS	
0228h - 022Fh	COM7 Forward to LPC BUS	
0238h - 023Fh	COM6 Forward to LPC BUS	
0278h - 027Fh	Printer port (IRQ 7, DMA 0)	*
02E8h - 02EFh	COM4 (IRQ 11)	*
02F8h - 02FFh	COM2 (IRQ 3)	*
0338h - 033Fh	COM5 Forward to LPC BUS	
0376h	IDE1 ATAPI device control write only register	*
03E8h - 03Efh	COM3 (IRQ 10)	*
03F0h - 03F7h	Floppy Disk (IRQ 6, DMA 2)	
03F6h	IDE0 ATAPI device control write only register	*
03F8h - 03FFh	COM1 (IRQ 4)	*
0480h - 048Fh	DMA High page register	*
0490h - 0499h	Instruction counter register	*
04D0h - 04D1h	8259 Edge,/ level control register	*
0CF8h - 0CFFh	PCI configuration port	*
D400h - D4FFh	on board LAN	*
FC00h - FC05h	SPI Flash BIOS control register	*
FC08h - FC0Dh	External SPI BUS control register (output pin configurable GPIO3[0-3])	*

IRQ Mapping

IRQ#	Description	Usage
IRQ0	System Timer	*
IRQ1	Keyboard Controller	*
IRQ2	Cascade for IRQ8 - 15	
IRQ3	Serial Port 2	*
IRQ4	Serial Port 1	*
IRQ5	USB / RTL8100B LAN1 / RTL8100B LAN2	*
IRQ6	Ethernet 10/100M LAN	*
IRQ7	Parallel Port	*
IRQ8	Real Time Clock	*
IRQ9	Serial Port 9	*
IRQ10	Serial Port 3	*
IRQ11	Serial Port 4	*
IRQ12	Mouse	*
IRQ13	Math Coprocessor	*
IRQ14	Hard Disk Controller#1	*
IRQ15	USB	*

DMA Mapping

DMA#	Description	Usage
DMA0		
DMA1		
DMA2	Floppy Disk Controller	
DMA3		
DMA5		
DMA6		
DMA7		

2.6 Watchdog Timer

There are two watchdog timers in Vortex86SX/DX CPU. One is compatible with M6117D watchdog timer and the other is new. The M6117D compatible watchdog timer is called WDT0 and new one is called WDT1.

We also provide DOS, Linux and WinCE example for your reference. For more technical support, please visit: http://www.dmp.com.tw/tech or download the PDF file: http://www.dmp.com.tw/tech/vortex86dx/

2.7 GPIO (General Purpose Input / Output)

40 GPIO pins are provided by the Vortex86SX/DX for general usage in the system. All GPIO pins are independent and can be configured as inputs or outputs, with or without pull-up/pull-down resistors.

We also offer DOS, Linux and WinCE example for your reference. For more technical support, please visit: http://www.dmp.com.tw/tech or download the PDF file: http://www.dmp.com.tw/tech/vortex86dx/

2.8 SPI flash (Serial Peripheral Interface)

As SPI Flash (Serial Peripheral Interface) offers many benefits including: reduced controller pin count, smaller and simpler PCBs, reduced switching noise, less power consumption, and lower system cost

Many of users may consider using a formatted SPI flash to boot for the system or emulate SPI flash as Floppy (A: Driver or B: Driver). Then you must know how to set for this condition in CMOS Setup and boot up under DOS 6.22, X-DOS, DR-DOS and Free DOS.

For more technical support, please visit: http://www.dmp.com.tw/tech or download the PDF file: http://www.dmp.com.tw/tech/vortex86dx/

Chapter 3

Driver Installation

LAN

The Vortex86SX processor also integrated 10/100Mbps Ethernet controller that supports both 10/100BASE-T and allows direct connection to your 10/100Mbps Ethernet based Local Area Network for full interaction with local servers, wide area networks such as the Internet.

The controller supports: Half / Full-Duplex Ethernet function to double channel bandwidth, auto media detection.

Operating system support

The Vortex86SX-6156-V2 PC/104 CPU board supports Embedded software: Free DOS, DOS 6.22, PCDOS 7.1, DR-DOS, x-DOS, OS/2, Windows CE 5.0 / 6.0

Please get the drivers from the Driver CD which attached with the standard packing of Vortex86SX-6156-V2 board or please get it from DMP official website: http://www.dmp.com.tw/tech/vortex86sx/

Vortex86SX-6156-V2 also supports most of the popular Linux distributions, for more detail information, please visit DMP official website: http://www.dmp.com.tw/tech/vortex86sx/

Appendix

A. TCP/IP library for DOS real mode

DSock is a TCP/IP library for DOS real mode, which is used by RSIP. It provides simple C functions for programmer to write Internet applications. ICOP also provide Internet examples using DSock: BOOTP/DHCP, FTP server, SMTP client/server, HTTP server, TELNET server, Talk client/server, etc.

DSock provides a lot of example source code. Programmer can add Internet functions to their project easily and save development time. With a utility "MakeROM", programmer also can make a ROM image to fit their application, those examples can be seen in the following Application systems: Mity-Mite Serial Server, Web Camera Tiny Server and RSIP Serial Server.

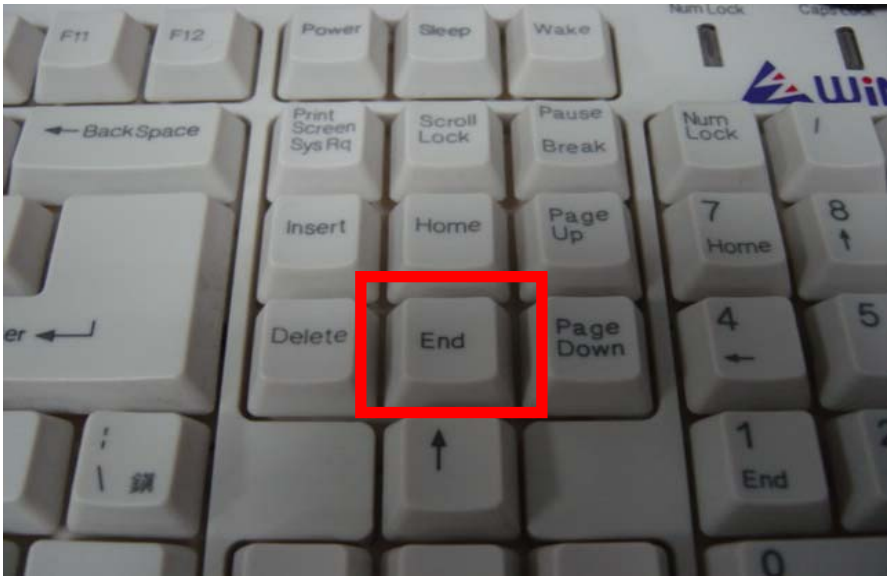
DSock is free for All ICOP products using M6117D/Vortex86/Vortex86SX/Vortex86DX CPU and ICOP also provide the business version of DSock for those customers who are using other x86 CPUs.
If you would like to use DSock or business version of DSock, Please mail to info@icop.com.tw or contact your regional sales.

Please download the trial DSock software and Utilities from our website:
http://www.dmp.com.tw/tech/dmp-lib/dsock/

B. BIOS Default setting

If the system cannot be booted after BIOS changes are made, Please follow below procedures in order to restore the CMOS as default setting.

- Press “End” Key, when the power on



- Press <Del> to enter the AMI BIOS setup
- Press “F9” to Load Optimized Defaults
- Press “F10” to Save configuration changes and exit setup

Warranty

This product is warranted to be in good working order for a period of one year from the date of purchase. Should this product fail to be in good working order at any time during this period, we will, at our option, replace or repair it at no additional charge except as set forth in the following terms. This warranty does not apply to products damaged by misuse, modifications, accident or disaster. Vendor assumes no liability for any damages, lost profits, lost savings or any other incidental or consequential damage resulting from the use, misuse of, originality to use this product. Vendor will not be liable for any claim made by any other related party. Return authorization must be obtained from the vendor before returned merchandise will be accepted. Authorization can be obtained by calling or faxing the vendor and requesting a Return Merchandise Authorization (RMA) number. Returned goods should always be accompanied by a clear problem description.

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