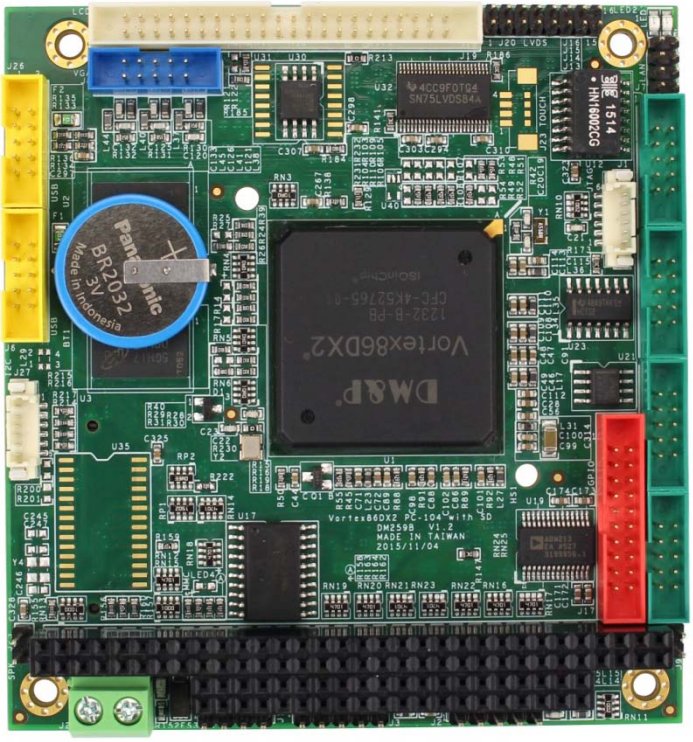
User Manual



NAD11-103-SD

with

DM&P Vortex86DX2
600MHz processor

Version 1.1

ICOP Technology Inc.

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Revision History

Revision	Date	Remark
1.0	January, 2016	First version release
1.1	September, 2016	Correct the 1.4 Specifications

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1 General Information

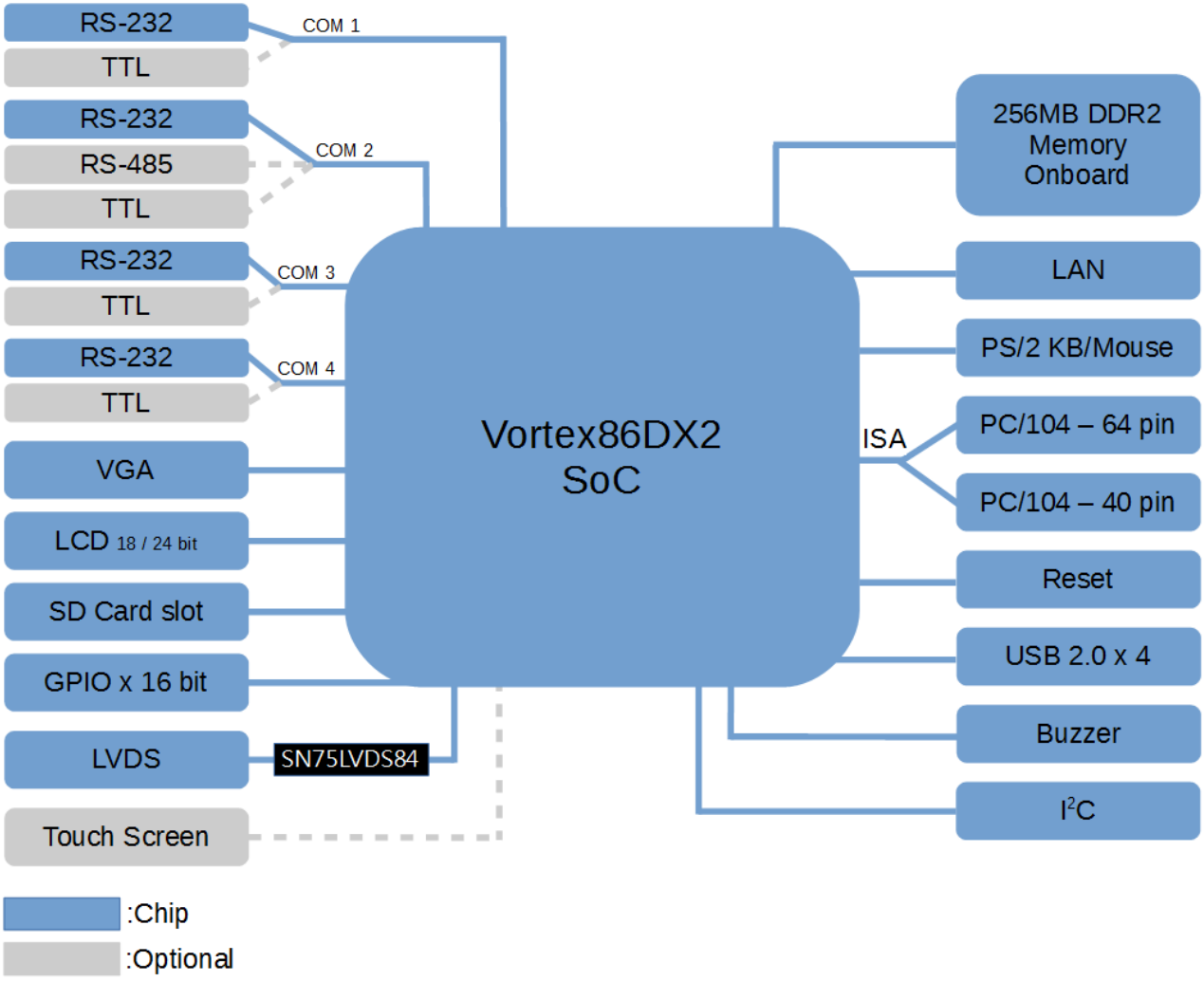
1.1 Overview

The NAD11-103-SD PC/104 family of low-power x86 embedded controller is designed to meet PC/104 specification with backward compatibility to provide migration path for projects facing end-of-life challenges with their existing x86 based PC/104 controller.

In addition, the NAD11-103-SD 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.

The NAD11-103-SD is suitable for broad range of data-acquisition, industrial automation, process control, automotive controller, AVL, intelligent vehicle management device, medical device, human machine interface, robotics, machinery control and more.

1.2 Block diagram



1.3 Packing list

Product Name	Package
NAD11-103-SD	Embedded Vortex86DX2 CPU Board PS/2 Mouse cable x 1 PS/2 Keyboard cable x 1 GPIO cable x 1 USB cable x 2 (USB port x 4) LAN cable x 1 VGA cable x 1 RS232 cable x 4 Screw Kit x 1

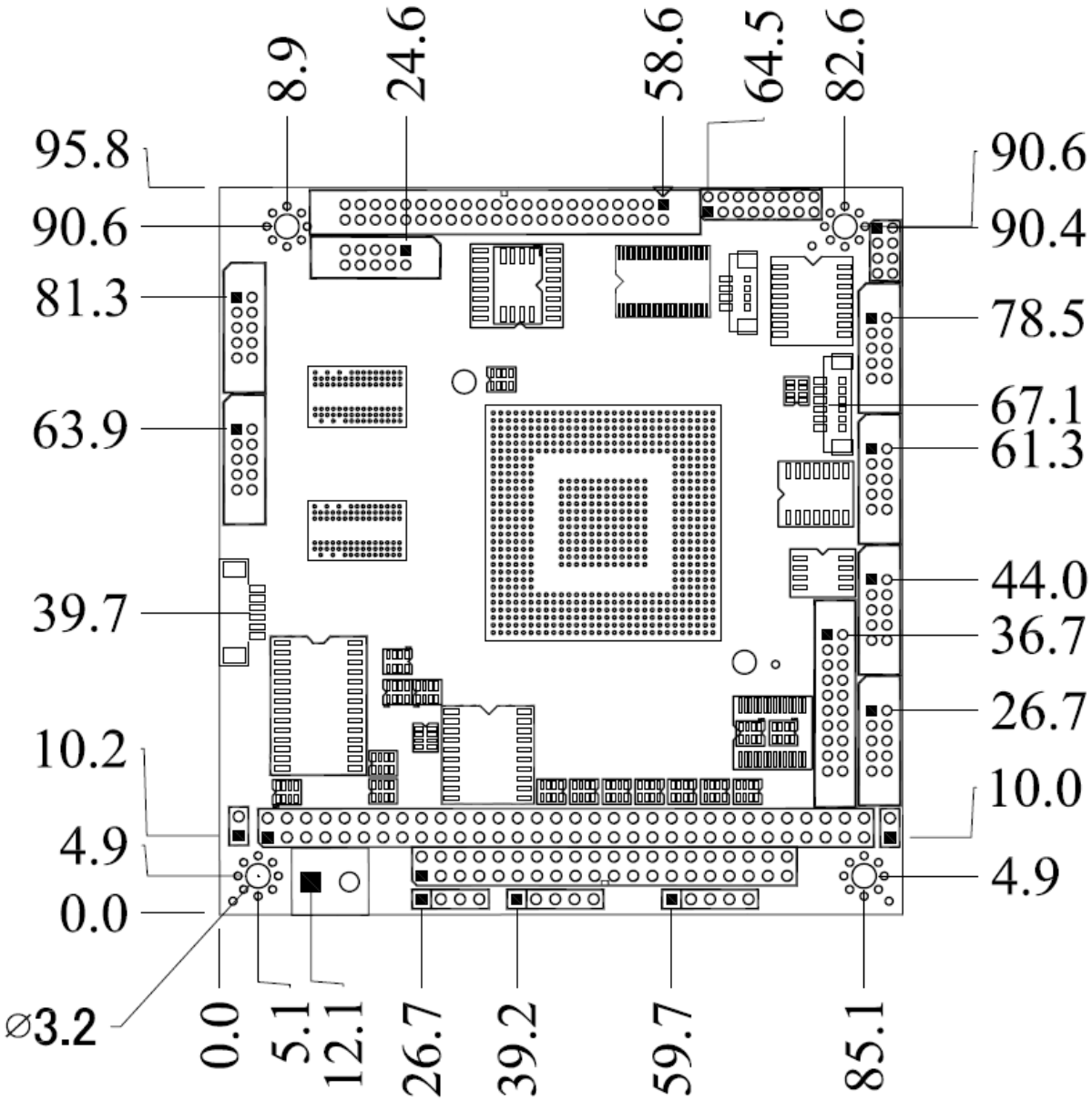
1.4 Specifications

Processor	DM&P SoC CPU Vortex86DX2 600MHz Real Time Clock with Lithium Battery Backup
Cache	L1:16K I-Cache, 16K D-Cache, L2 Cache:256KB
Bus	PC/104 Standard Compliant
System Memory	256MB DDR2 Onboard
Watchdog Timer	Software programmable from 30.5μ seconds to 512 seconds x2 sets(Watchdog 1 fully compatible with M6117D)
VGA	Integrated 2D VGA chip with dual display support (VGA + TTL /VGA + LVDS) VGA: Maximum resolution up to 1280x1024 @ 60Hz LVDS: Maximum resolution up to 1024x768 @ 60Hz Single channel 18-bit LVDS
LAN	Integrated 10/100Mbps Ethernet x1
Flash Disk Support	Onboard 4MB SPI Flash Disk SD Card
Touch controller	PS/2 interface (Optional)
I/O Interface	RS232 port x3 RS-232/485 port x1 USB port (Ver. 2.0) x4 USB HotSWAP x1(Optional) 16-bit GPIO port x1 10/100Mbps Ethernet port x1 I^2C port x1

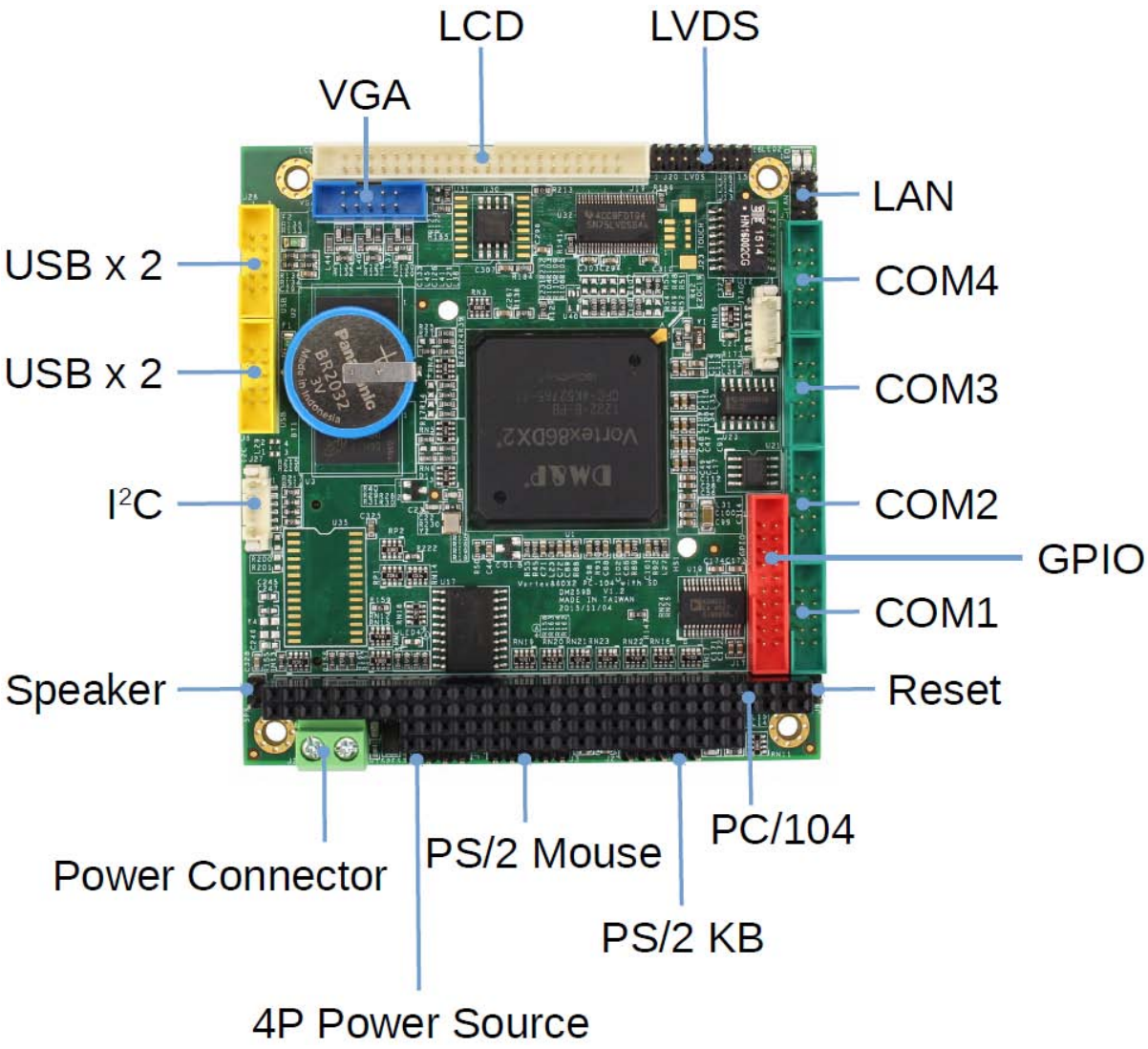
Connectors	2.0mm 44-pin box header for LCD x1 2.0mm 20-pin box header for 16-bit GPIO x1 2.0mm 16-pin header for LVDS x1 2.0mm 10-pin box header for VGA x1 2.0mm 10-pin box header for USB x2 2.0mm 10-pin box header for RS232 x4 2.0mm 8-pin header for Ethernet x1 2.54mm 2-pin header for Reset x1 2.54mm 5-pin box header for Keyboard x1 2.54mm 5-pin header for Mouse x1 2.54mm 4-pin header for -5V, -12V +12V, GND x1 1.25mm 6-pin wafer for I^2C x1 1.25mm 4-pin wafer for Touch Screen x1(Optional)
Power Requirement	Single Voltage +5V @ 790mA
Weight	110g
Dimensions	90mm x 96mm (3.54 x 3.77 inches)
Operating Temp.	-20°C ~ +70°C -40°C ~ +85°C (Optional)
Operating System Support	Free DOS, DOS 6.22, PCDOS 7.1, DR-DOS, x-DOS, OD/2, Windows Embedded Compact 7, Windows Embedded Compact 6, Windows XP Professional, Windows Embedded Standard(XPE), POS Ready(WePOS), Embedded Linux, X-linux, QNX, Vxworks and FreeBSD.

2 Hardware Information

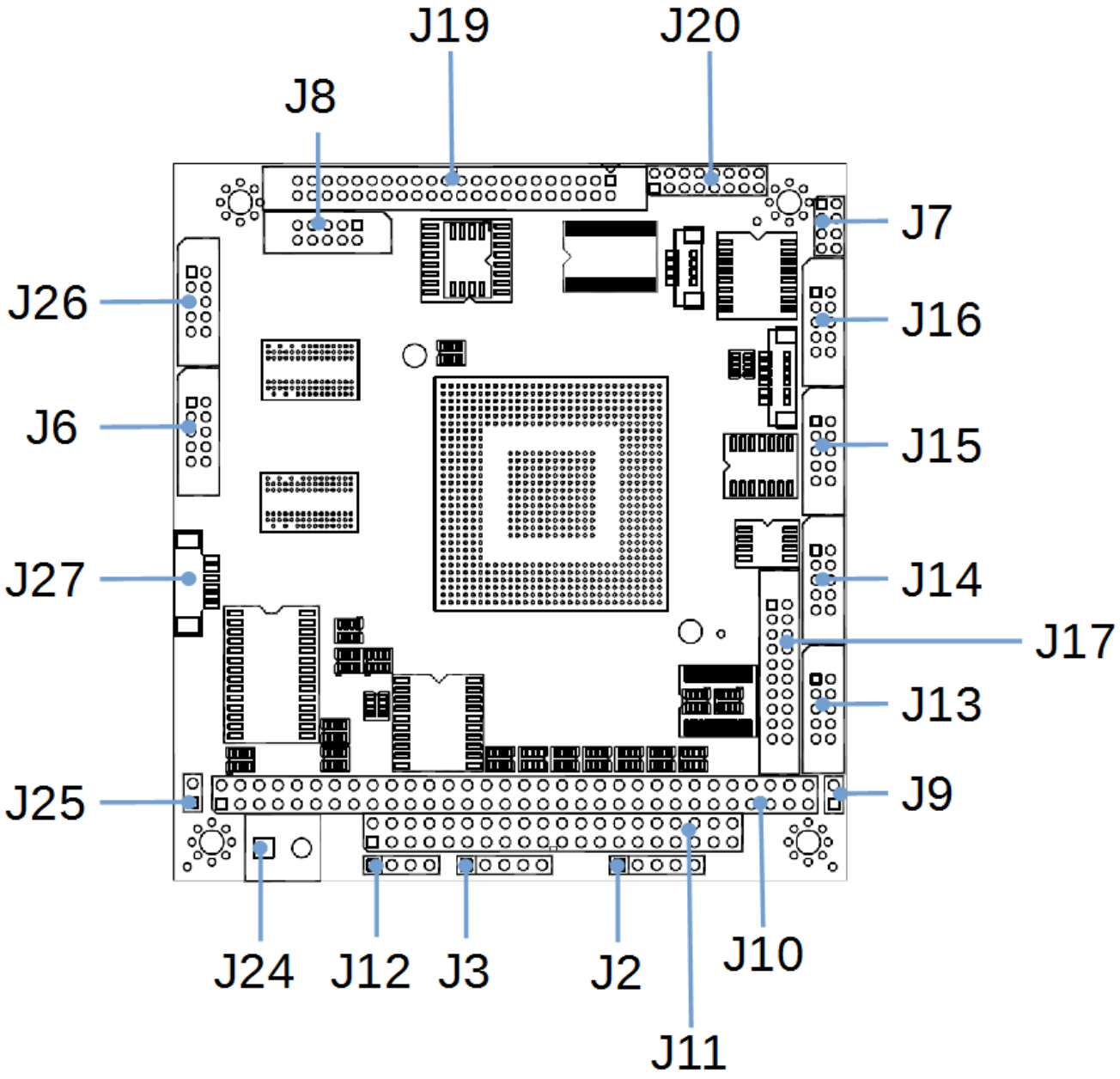
2.1 Dimension



2.2 Board Outline



2.3 Connector Location



2.4 Connector and Jumper Summary

Nbr.	Name	Type of Connections	Pin Nbr
J2	PS/2 Keyboard	Pin Header, 2.54mm, 1x5	5
J3	PS/2 Mouse	Pin Header, 2.54mm, 1x5	5
J6	USB 0&1	Box Header, 2.0mm 5x2	10
J7	LAN	Pin Header, 2.0mm, 4x2	8
J8	VGA	Box Header, 2.0mm, 5x2	10
J9	Reset	Pin Header, 2.54mm, 1x2	2
J10	PC/104 Connector – 64 pin	Box Header, 2.54mm, 32x2	64
J11	PC/104 Connector – 40 pin	Box Header, 2.54mm, 20x2	40
J12	4P Power Source	Pin Header, 2.54mm, 1x4	4
J13	COM1 (RS232) (Optional: TTL)	Box Header, 2.0mm, 5x2	10
J14	COM2 (RS232/485) (Optional: TTL)	Box Header, 2.0mm, 5x2	10
J15	COM3 (RS232) (Optional: TTL)	Box Header, 2.0mm, 5x2	10
J16	COM4 (RS232) (Optional: TTL)	Box Header, 2.0mm, 5x2	10
J17	GPIO PORT 0/1	Box Header, 2.0mm, 10x2	20
J19	LCD Connector	Box Header, 2.0mm, 22x2	44
J20	LVDS	Pin Header, 2.0mm, 8x2	16
J23	Touch Screen(Optional)	Wafer, 1.25mm, 1x4	4
J24	Power Connector	Terminal Block 5.0mm, 2x1	2
J25	Buzzer	Pin Header, 2.54mm, 1x2	2
J26	USB 2&3	Box Header, 2.0mm 5x2	10
J27	I^2C	Wafer, 1.25mm, 1x6	6
J28	SD Card slot		

2.5 Pin Assignments & Jumper Settings

J2: PS/2 Keyboard

Pin#	Single Name	Pin #	Single Name
1.	KBCLK	2	KBDATA
3	NC	4	GND
5	VCC		

J3: PS/2 Mouse

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

J6: USB 0&1

Pin#	Single Name	Pin #	Single Name
1.	VCC	2	VCC
3	LUSBD0-	4	LUSBD1-
5	LUSBD0+	6	LUSBD1+
7	GND	8	GND
9	GGND	10	GGND

J7: LAN

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

J8: VGA

Pin#	Single Name	Pin #	Single Name
1.	R OUT	2	GND
3	G OUT	4	GND
5	B OUT	6	GND
7	HSYNC_A	8	GND
9	VSYNC_A	10	GND

J9: Reset

Pin#	Single Name	Pin #	Single Name
1.	RST_SW	2	GND

J10: PC/104 Connector – 64 pin

Pin#	Single Name	Pin #	Single Name
1.	IOCHCK	2	GND
3	SD7	4	XRSTDRV
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	XOSC
61	SA0	62	GND
63	GND	64	GND

J11: PC/104 Connector – 40 pin

Pin#	Single Name	Pin #	Single Name
1.	GND	2	GND
3	MEMCS16	4	SBHE
5	IOCS16	6	LA23
7	IRQ10	8	LA22
9	IRQ11	10	LA21
11	IRQ12	12	LA20
13	IRQ15	14	LA19
15	IRQ14	16	LA18
17	DACK0	18	LA17
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

J12: 4P Power Source

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

J13: COM1 (RS232) (Optional: TTL)

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

J14: COM2 (RS232/485) (Optional: TTL)

Pin#	Single Name	Pin #	Single Name
1.	DCD2/2RS485-	2	RXD2/2RS485+
3	TXD2	4	DTR2
5	GND	6	DSR2
7	RTS2	8	CTS2
9	RI2	10	VCC

J15: COM3 (RS232) (Optional: TTL)

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

J16: COM4 (RS232) (Optional: TTL)

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

J17: GPIO PORT 0/1

Pin#	Single Name	Pin #	Single 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

J19: LCD Connector

Pin#	Single Name	Pin #	Single Name
1.	+3.3V	2	+3.3V
3	LG2	4	LG3
5	LG4	6	LG5
7	NC	8	NC
9	LR0	10	LR1
11	LR2	12	LR3
13	LR4	14	LR5
15	GND	16	NC
17	NC	18	NC
19	NC	20	GND
21	NC	22	NC
23	LB0	24	LB1
25	LB2	26	LB3
27	LB4	28	LB5
29	NC	30	NC
31	LG0	32	LG1
33	GND	34	GND
35	NC	36	LCLK
37	NC	38	LDE
39	NC	40	LHS
41	NC	42	LVS
43	LENBL	44	LEPVDD

J20: LVDS

Pin#	Single Name	Pin #	Single Name
1.	VCC3 (+3.3V)	2	VCC3 (+3.3V)
3	GND	4	GND
5	Y0P	6	Y0M
7	Y1M	8	GND
9	GND	10	Y1P
11	Y2P	12	Y2M
13	CLKOUTM	14	GND
15	GND	16	CLKOUTP

J23: Touch Screen (Optional)

Pin#	Single Name	Pin #	Single Name
1.	Y-	2	X-
3	Y+	4	X+

J24: Power Connector

Pin#	Single Name	Pin #	Single Name
1.	+5V	2	GND

J25: Buzzer

Pin#	Single Name	Pin #	Single Name
1.	Buzzer	2	VCC

J26: USB 2&3

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

J27: I²C

Pin#	Single Name	Pin #	Single Name
1.	VCC	2	GND
3	SCL1	4	SDA1
5	NC	6	VCC3

J28: SD Card slot

Pin#	Single Name	Pin #	Single Name
1.	XSDA_D3	2	XSDA_CMD
3	GND	4	VCC3
5	XSDA_CLK	6	GND
7	XSDA_D0	8	XSDA_D1
9	XSDA_D2	10	SDA_CD
11	SDA-WP	12	GND
13	GND		

System Mapping

Memory Mapping		
Address	**Description**	**Usage**
00000000 – 0009FFFF	System RAM	*
000A0000 – 000AFFFF	EGA/VGA Video Memory	*
000B0000 – 000B7FFF	MDA RAM, Hercules graphics display RAM	*
000B8000 – 000BFFFF	CGA display RAM	*
000C0000 – 000C7FFF	EGA/VGA BIOS ROM	*
000C8000 – 000CFFFF	Boot ROM enable	
000CC000 – 000CFFFF	Console Redirection enable	
000D0000 – 000D7FFF	Expansion ROM space	
000D8000 – 000D8FFF	SPI Flash Emulation Floppy A Enable	
000DC000 – 000DFFFF	Expansion ROM Space	
000E0000 – 000EFFFF	USB Legacy SCSI ROM space	
000F0000 – 000FFFFF	Motherboard BBIOS	*
FEFDBC00 – FEFDBCFF	Standard OpenHCD USB Host Controller	*
FEFBB400 – FEFBB4FF	Onboard Ethernet Adapter	*
FEFDB800 – FEFDBFFF	Standard Enhanced PCI to USB Host Controller	*

I/O Mapping		
Address	**Description**	**Usage**
0000h – 000Fh	DMA 8237-1	*
0020h – 0021h	PIC 8259-1	*
0022h – 0023h	Indirect Access Registers (6117D configuration port)	*
0040h –0043h	Timer Counter 8254	*
0060h	Keyboard / Mouse data port	
0061h	Port B + NMI control port	*
0062h – 0063h	8051 download 4k address counter	
0064h	Keyboard/ Mouse status/ command port	
0065h	WatchDog0 reload counter	
0070h – 0071h	CMOS RAM port	*
0072h – 0075h	MTBF control register	*
0078h – 007Ch	GPIO port 0,1,2,3,4 default setup	*
0080h – 008Fh	DMA page register	
0092h	System control register	*
0093h – 0097h	GPIO port 6,7,8,9,A direction control	*
0098h – 009Dh	GPIO port 0,1,2,3,4,5 direction control	*
00A0h – 00A1h	PIC 8259-2	*
00A8h – 00ADh	WatchDog1 control counter	*
00AEh	WatchDog1 reload counter	*
00C0h – 00DFh	DMA 8237-2	*
00E0h – 00EFh	DOS 4G Page access	*
0100h – 0105h	GPIO port 5,6,7,8,9,A default setup	*
0170h – 0177h	IDE 1(IRQ 15)	*
0278h – 027Fh	Printer port (IRQ7, DMA 0)	*
02E8h – 02EFh	COM4 (IRQ 11)	*
02F8h – 02EFh	COM2 (IRQ 3)	*
03E8h – 03EFh	COM3 (IRQ 10)	*
03F6h	IDE1 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	*
DE00h – DEFFh	On board LAN	*
FC00h – FC05h	SPI Flash BIOS control register	*

FC08h – FC0Dh	External SPI BUS control register	*

IRQ Mapping		
Address	**Description**	**Usage**
IRQ0	System Timer	*
IRQ1	Keyboard Controller	*
IRQ2	Cascade for IRQ8~15	
IRQ3	Serial port 2	*
IRQ4	Serial port 1	*
IRQ5	USB	*
IRQ6	USB	
IRQ7	Printer Port	*
IRQ8	Real Timer Clock	*
IRQ9	USB/ Ethernet 10/ 100M LAN	*
IRQ10	Serial Port 3	*
IRQ11	Serial Port 4	*
IRQ12	Mouse	*
IRQ13	Math Coprocessor	*
IRQ14	Multimedia Device	*
IRQ15	Hard Disk Controller #2	*

DMA Mapping		
Address	**Description**	**Usage**
DMA0		
DMA1		
DMA2		
DMA3		
DMA4		
DMA5		
DMA6		
DMA7		

3 Software Resources

3.1 ICOP Technical Resource Website

In the following website, you will find our latest user manuals, including OS support resources systems such as evaluation images for Windows Embedded CE 7.0, Windows Embedded CE 6.0, Windows Embedded CE 5.0, and Windows XP Embedded (Win XPe). For details, please kindly visit the following link: http://tech.icop.com.tw/

3.2 Vortex86 Processor Programming Guide

Vortex86 processor programming guide is for software programmers to build their programs more quickly and easily on Vortex86 processor. This programming guide also includes the installation guide for X-Linux, Debian & Ubuntu Linux guide and board support package (BSP) for Windows Embedded OS on Vortex86SX/DX/MX. For details, please kindly visit the following link: http://www.dmp.com.tw/tech/

4 Technical support

4.1 LCD

4.1.1 Introduction

The NAD11-103-SD offers two different interfaces which support maximum resolution up to 1024 x 768 (at 60MHz) connecting to LCD Flat Panel: 18-bit/24-bit TFT-LCD and 18-bit LVDS.

4.1.2 Pin Assignment of LVDS and TFT-LCD

LVDS Pin Assignment

LVDS Pin#	Pin Name	LVDS Pin#	Pin Name
1	VCC3 (+3.3V)	2	VCC3 (+3.3V)
3	GND	4	GND
5	Y0P	6	Y0M
7	Y1M	8	GND
9	GND	10	Y1P
11	Y2P	12	Y2M
13	CLKOUTM	14	GND
15	GND	16	CLKOUTP

TFT Flat Panel Data Output

LCD Pin#	Vortex86DX2 Pin Name	DIGITAL 18 bits	RGB 24 bits
1	LCDVCC (+3.3V)	VDD	VDD
2	LCDVCC (+3.3V)	VDD	VDD
3	FPD12	G2	G4
4	FPD13	G3	G5
5	FPD14	G4	G6
6	FPD15	G5	G7
7	FPD16	/	R0
8	FPD17	/	R1
9	FPD18	R0	R2
10	FPD19	R1	R3
11	FPD20	R2	R4
12	FPD21	R3	R5
13	FPD22	R4	R6
14	FPD23	R5	R7
15	GND	VSS	VSS
16	NC	/	/
17	NC	/	/
18	NC	/	/
19	NC	/	/
20	GND	VSS	VSS
21	FPD00	/	B0
22	FPD01	/	B1
23	FPD02	B0	B2
24	FPD03	B1	B3
25	FPD04	B2	B4
26	FPD05	B3	B5
27	FPD06	B4	B6
28	FPD07	B5	B7
29	FPD08	/	G0
30	FPD09	/	G1
31	FPD10	G0	G2
32	FPD11	G1	G3
33	GND	VSS	VSS
34	GND	VSS	VSS
35	NC	/	/

36	FP1CLK	XCLK	XCLK
37	NC	/	/
38	FP1DE	DEN	DEN
39	NC	/	/
40	FP1HS	HSYNC	HSYNC
41	NC	/	/
42	FP1VS	VSYNC	VSYNC
43	FPENBLT	ADJ	ADJ
44	FPENVDD	VDDEN	VDDEN

4.2 BIOS

4.2.1 Introduction

Featuring AMI BIOS, the NAD11-103-SD is the one stable PC/104 computer board for your application. In this section, we will introduce you some basic AMI BIOS settings such as console redirection, and RS232/485 switching, etc.

4.2.2 Console Redirection

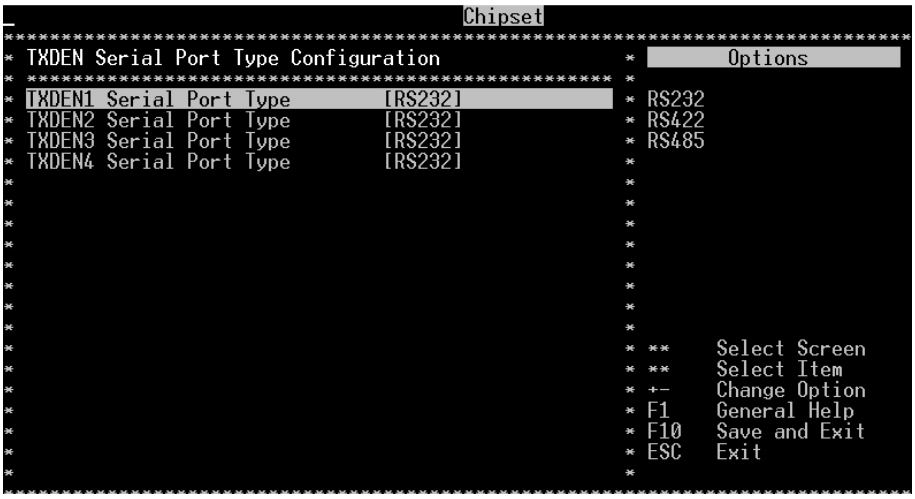
Access to computer board through serial port, you can work on NAD11-103-SD without VGA display or monitor. The default access port is COM1 and disabled. If you would like to use this function, please go to the path below to enable Console Redirection.

Path: Advanced >Remote Access Configuration >Remote Access

4.2.3 RS232/485 Switching

COM2 on NAD11-103-SD is available switching from RS232 to RS485, and vice versa. You can choose the mode you prefer depending on your demands. The default setting for serial port is RS232.

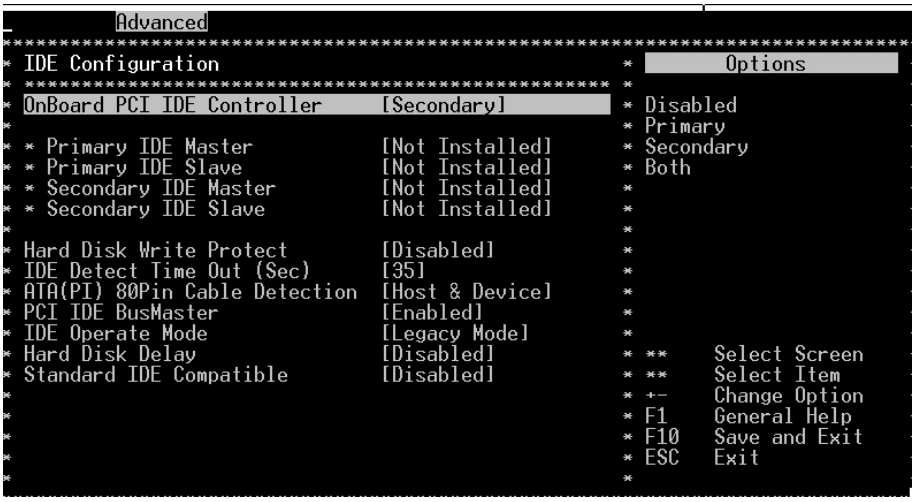
Path:
Chipset >Southbridge Configuration >TXDEN Serial Port Type Configuration



4.2.4 IDE Configuration

The default IDE configuration is for Windows Operating System as the following pictures shown, and the setting of **IDE Operate Mode** and **Standard IDE Compatible** are **[Legacy]** and **[Disabled]**.

Path: Advanced >IDE Configuration
>IDE Operate Mode [Legacy]
>Standard IDE Compatible [Disabled]



If you would like to install Linux on ICOP's computer boards, please change **IDE Operate Mode** to **[Native]** and **enable Standard IDE Compatible**.

Path: Advanced >IDE Configuration
>IDE Operate Mode [Native]
>Standard IDE Compatible [Enabled]

4.2.5 Advanced PCI/PnP Setting

Two statuses for IRQ setting:

IRQ3 [Reserved]: IRQ is reserved for an ISA device.
IRQ5 [Available]: IRQ is free to be allocated for an I/O device.

Path: PCIPnp >IRQ

Warranty

This product is warranted to be in good working order for a period of one year (12 months) 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 without 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 is 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. Should you have questions about warranty and RMA service, please contact us directly.

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