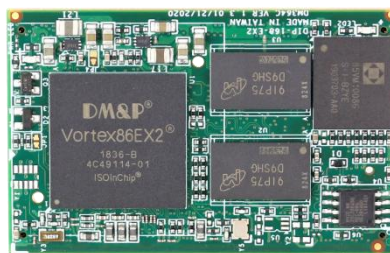


VEX2-DIP168



VortexEX2

VEX2 168 pins System-On-Module User's manual

Version 1.0

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Revision History

Revision	Date	Remark
1.0	2020.07.16	First revision

Table of Contents

1	General Information.....	1
1.1	Overview	1
1.2	Block diagram.....	1
1.3	Specifications	2
1.4	Ordering Information	3
2	Hardware Information	4
2.1	Dimension.....	4
2.2	Connectors.....	5
2.2.1	Connector on Module (Female)	5
2.2.2	Matching connector on board (Male).....	5
2.3	Recommended Layout (for module).....	6
2.4	Pin Assignments & Jumper Setting.....	7
2.4.1	Pin assignment.....	7
2.2	Pin Table List.....	9
2.3	Signal Description.....	10
3	Programmable I/O Selection.....	14
3.1	Programmable I/O overview.....	14
3.2	Selection Table for I/O Function	17
4	Software Resources.....	18
4.1	BIOS	18
4.2	Software.....	18
5	ADC	19
5.1	ADC overview.....	19
5.2	ADC Sample code	19
6	Evaluation Board	20

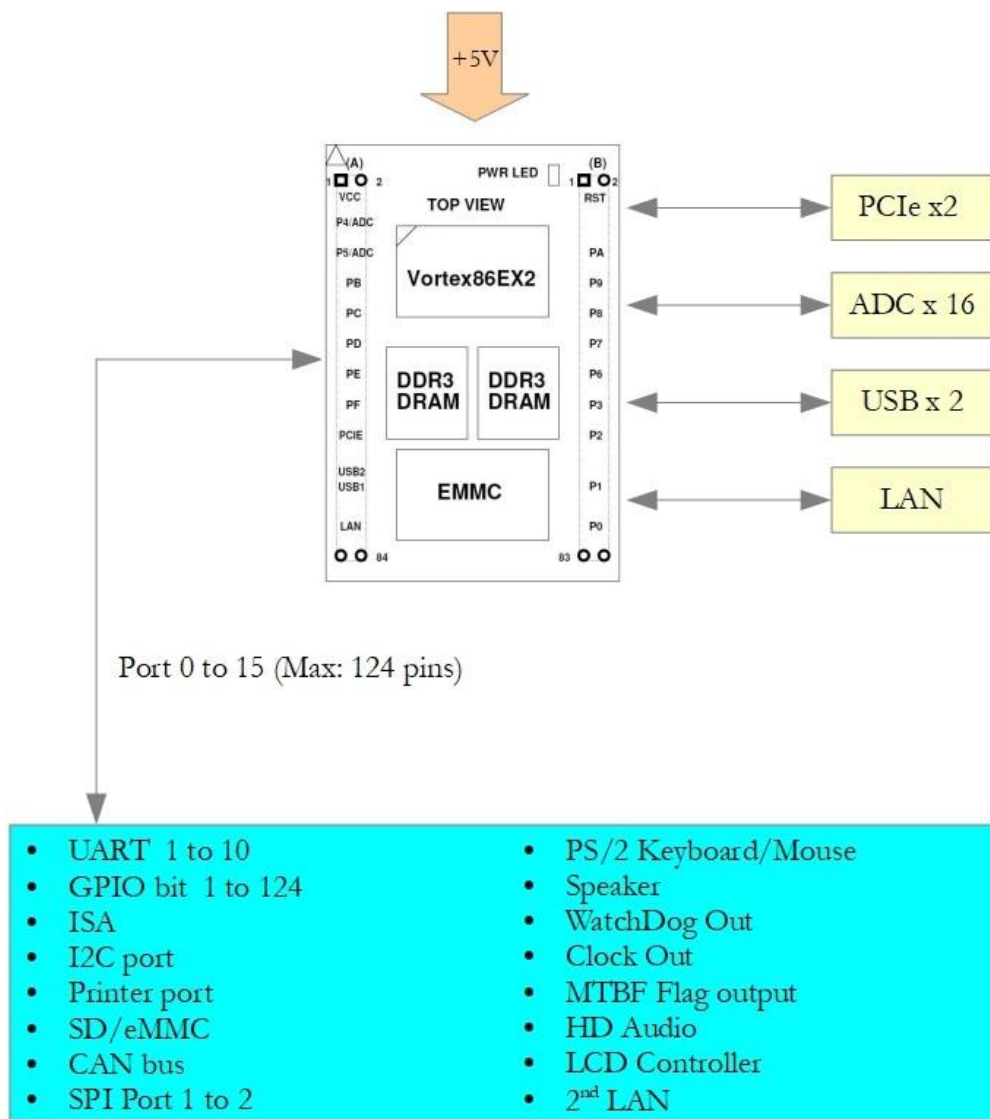
Warranty.....22

1 General Information

1.1 Overview

The VEX2-DIP168 is a 35mm(L) x 55mm(W), 168 pins, single +5V input, System On Module with Vortex86EX2 build-in 512MB/1GB DDR3; also take advantage of Vortex86EX2 Programmable I/O as a powerful, flexible, tiny and low power module.

1.2 Block diagram



1.3 Specifications

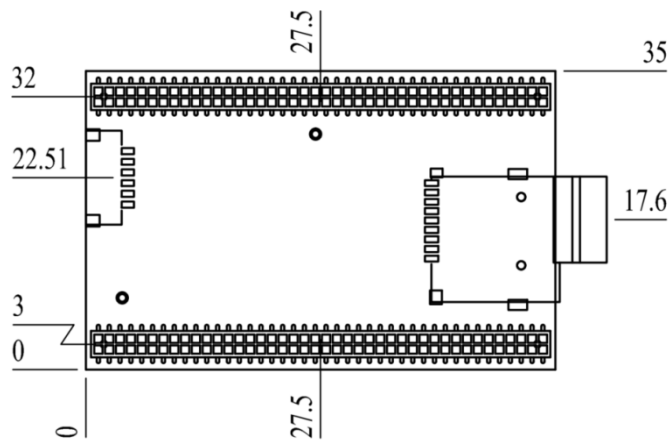
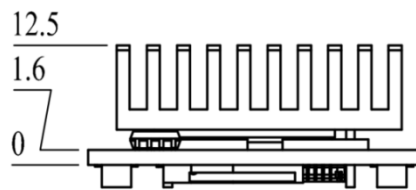
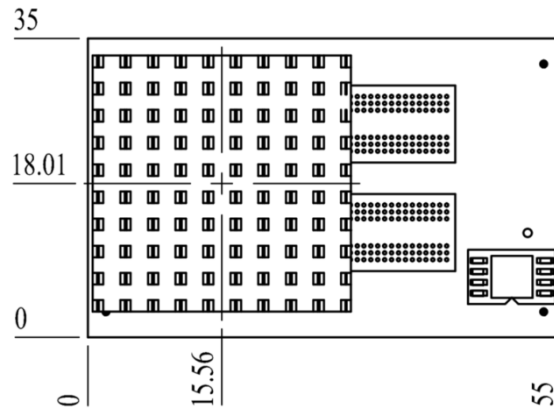
Processor	DM&P SoC CPU Vortex86EX2 600MHz
RAM	512MB/1GB DDR3 Onboard
BIOS	Coreboot BIOS
Bus	PCI Express x2 ISA
LAN	Integrated 10/100Mbps Ethernet
Disk Support	Micro SD/eMMC (Option)
I/O Interface	USB v2.0 port x2
I/O Configuration support up to 124 pins	GPIO up to 120-bit ADC 12-bit channel x16 CAN x2 ISA Printer Keyboard COM port x10 (max.) I ² C x2 SPI x2 HD Audio SD/MMC LAN WatchingDog Timer MTBF
Power Requirement	Single Voltage +5VDC @ 360mA
Operating Temperature	-20°C to +70°C -40°C to +85°C (Option)
Dimension	35mm(L) x 55mm(W)
Weight	15g
O/S Support	DOS FreeBSD Windows CE6/Embedded Compact 7 VxWorks X-Linux QNX

1.4 Ordering Information

Product Name	Description
VEX2-DIP168-3NE1	Vortex86EX2 DIP168 pin CPU Module with 512MB DDR3, Micro SD disk support
VEX2-DIP168-4NE1	Vortex86EX2 DIP168 pin CPU Module with 1GB DDR3, Micro SD disk support
VEX2-DIP168-3EE1	Vortex86EX2 DIP168 pin CPU Module with 512MB DDR3, 4GB eMMC disk support
VEX2-DIP168-4EE1	Vortex86EX2 DIP168 pin CPU Module with 1GB DDR3, 4GB eMMC disk support

2 Hardware Information

2.1 Dimension



2.2 Connectors

2.2.1 Connector on Module (Female)

- Vendor: Conn Top Component INC
- Item number: P3N23-242D1BKC000E

2.2.2 Matching connector on board (Male)

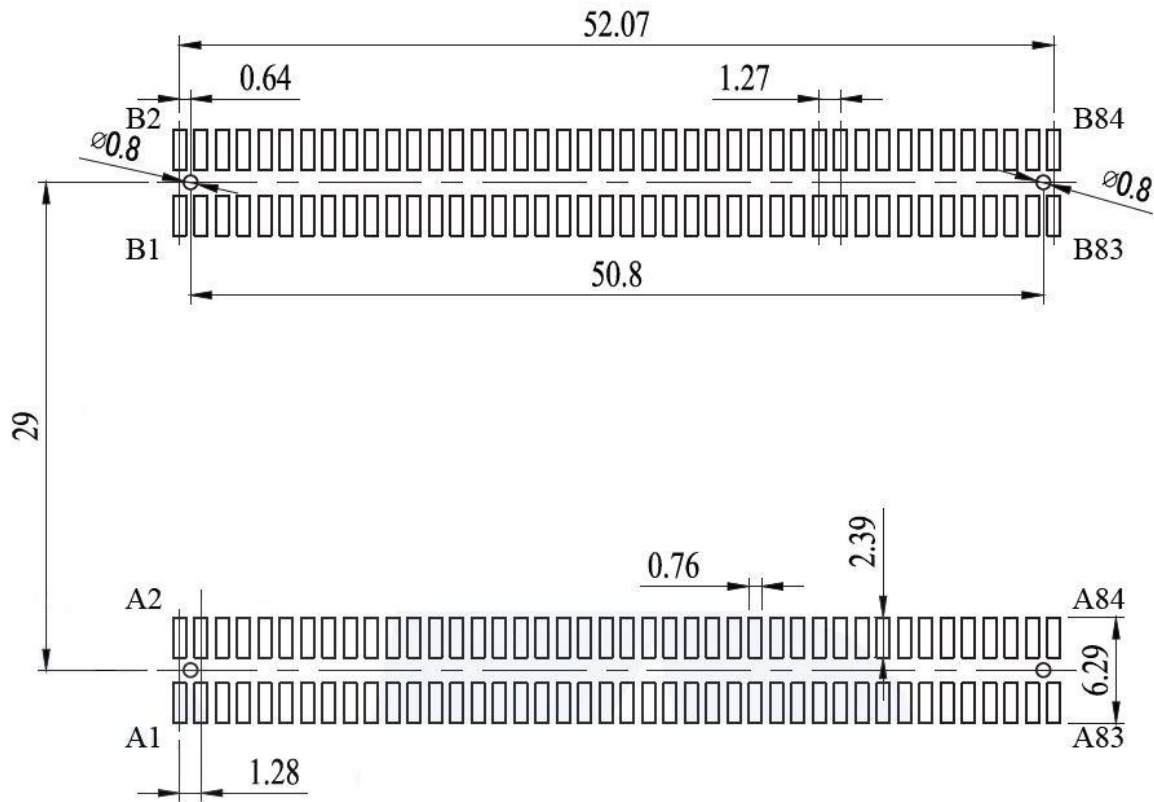
On the carrier board, it needs 2 pcs of matching connectors. Here is the connector detail for your reference.

- Vendor: Conn Top Component INC.
- Conn Top item number: number: H3N25-242D1BKC002F
- ICOP item number: number: PH2*42(1.27)-5.3MM

Note: Customer can buy connector from ICOP. The item number is PH2*42(1.27)-5.3MM. For details, please contact ICOP sales.

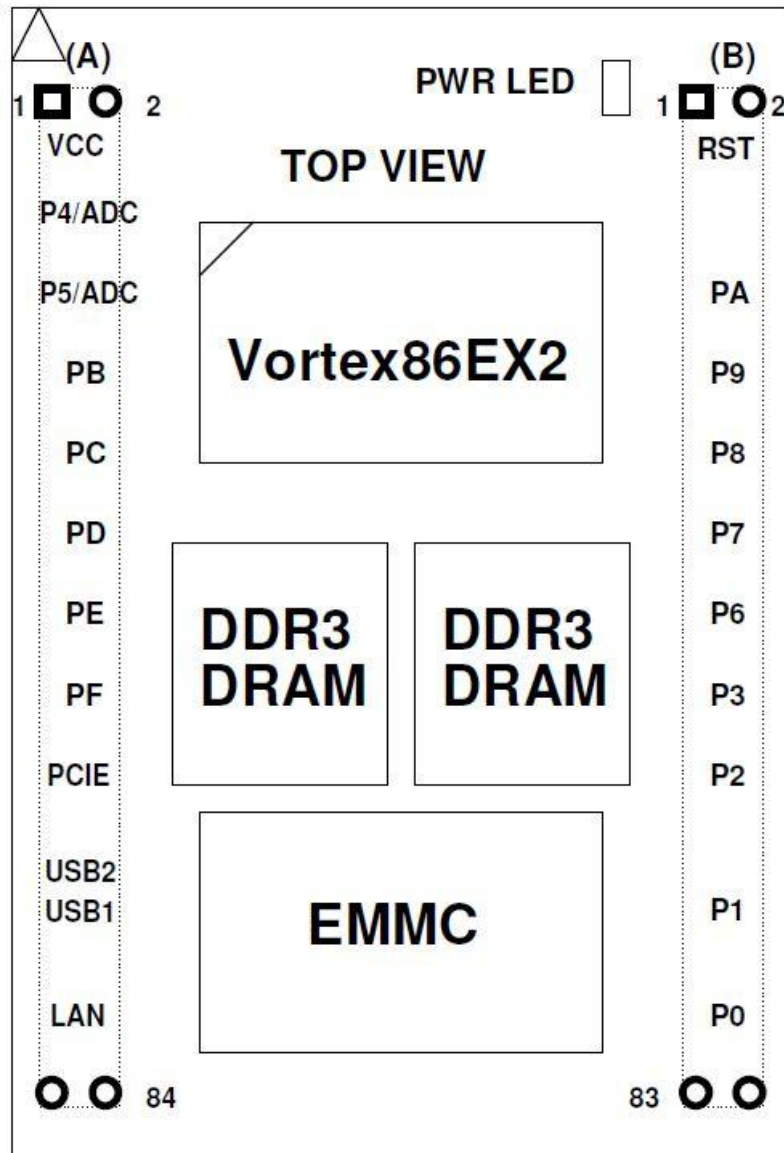
2.3 Recommended Layout (for module)

Please keep the whole area empty between two matching connector on your carrier board.



2.4 Pin Assignments & Jumper Setting

2.4.1 Pin assignment



As the image above, there are two rows of connector on VEX2-DIP168; Pin A1~A84 is on the left and Pin B1~B84 is on the right. Please see the pin assignments on the next page.

Pin#	Signal Name	Pin#	Signal Name	Pin#	Signal Name	Pin#	Signal Name
A1	VCC	A2	GND	B1	RESET-	B2	Master_PCI_RST-
A3	VCC	A4	GP40	B3	RSTDRV	B4	SYS-FAIL-OUT
A5	GP41	A6	GP42	B5	SYS-FAIL-IN	B6	SYS-SW-IN
A7	GP43	A8	GP50	B7	GPA0	B8	GPA1
A9	GP51	A10	GP52	B9	GPA2	B10	GPA3
A11	GP53	A12	GP54	B11	GPA4	B12	GPA5
A13	GP55	A14	GP56	B13	GPA6	B14	GPA7
A15	GP57	A16	VCC3_OUT	B15	GND	B16	GP90
A17	GPB0	A18	GPB1	B17	GP91	B18	GP92
A19	GPB2	A20	GPB3	B19	GP93	B20	GP94
A21	GPB4	A22	GPB5	B21	GP95	B22	GP96
A23	GPB6	A24	GPB7	B23	GP97	B24	GP80
A25	GPC0	A26	GPC1	B25	GP81	B26	GP82
A27	GPC2	A28	GPC3	B27	GP83	B28	GP84
A29	GPC4	A30	GPC5	B29	GP85	B30	GP86
A31	GPC5	A32	GPC7	B31	GP87	B32	Slave_PCI_RST-
A33	GND	A34	GPD0	B33	GP70	B34	GP71
A35	GPD1	A36	GPD2	B35	GP72	B36	GP73
A37	GPD3	A38	GPD4	B37	GP74	B38	GP75
A39	GPD5	A40	GPD6	B39	GP76	B40	GP77
A41	GPD7	A42	GPE0	B41	GP60	B42	GP61
A43	GPE1	A44	GPE2	B43	GP62	B44	GP63
A45	GPE3	A46	GPE4	B45	GP64	B46	GP65
A47	GPE5	A48	GPE6	B47	GP66	B48	GP67
A49	GPE7	A50	GND	B49	GND	B50	GP30
A51	GPF0	A52	GPF1	B51	GP31	B52	GP32
A53	GPF2	A54	GPF3	B53	GP33	B54	GP34
A55	GPF4	A56	GPF5	B55	GP35	B56	GP36
A57	GPF6	A58	GPF7	B57	GP37	B58	GP20
A59	GND	A60	PE1_CLK+	B59	GP21	B60	GP22
A61	PE1_TX+	A62	PE1_CLK-	B61	GP23	B62	GP24
A63	PE1_TX-	A64	PCIE_RST-	B63	GP25	B64	GP26
A65	PE1_RX+	A66	PE0_CLK+	B65	GP27	B66	GND
A67	PE1_RX-	A68	PE0_CLK-	B67	GP10	B68	GP11
A69	PE0_TX+	A70	PE0_RX+	B69	GP12	B70	GP13

A71	PE0_TX-	A72	PE0_RX-	B71	GP14	B72	GP15
A73	GND	A74	USBD_VBUS	B73	GP16	B74	GP17
A75	USBD1+	A76	USBD2+	B75	GP00	B76	GP01
A77	USBD1-	A78	USBD2-	B77	GP02	B78	GP03
A79	GND	A80	VCC1.8_OUT	B79	GP04	B80	GP05
A81	LANTX+	A82	LANRX+	B81	GP06	B82	GP07
A83	LANTX-	A84	LANRX-	B83	GND	B84	VBATT

2.2 Pin Table List

Category	Function	Pin Num.
SYSTEM	RESET- , Master_PCI_RST-, Slave_PCI-RST-,	3
Programmable Interface	GP0[7:0], GP1[7:0], GP2[7:0], GP3[7:0], GP4[3:0], GP5[7:0], GP6[7:0], GP7[7:0], GP8[7:0], GP9[7:0], GPA[7:0], GPB[7:0], GPC[7:0], GPD[7:0], GPE[7:0], GPF[7:0]	124
USB Interface	USBD1-, USBD2-, USBD1+, USBD2+	4
PCIE Bus Interface	PE0_TX-, PE0_RX-, PE0_TX+,PE0_RX+, PE0_CLK-, PE0_CLK+, PE1_TX-, PE1_RX-, PE1_TX+,PE1_RX+, PE1_CLK-, PE1_CLK+	12
Ethernet Interface	LANTX-, LANRX-, LANTX+, LANRX+	4
ADC Interface	ADC0_0, ADC0_1, ADC0_2, ADC0_3 ADC1_0, ADC1_1, ADC1_2, ADC1_3, ADC1_4, ADC1_5, ADC1_6, ADC1_7	12
Battery Power	VBATT	1
ADC Power	AGND, AGND	2
3.3V Power	VCC3_OUT	1
1.8V Power	VCC1.8_OUT	1
5V Power	VCC	2
Digital Ground	GND	10

2.3 Signal Description

System (3pins)

PIN#	Function	TYPE	Description
B1	RESET-	I	System Reset. This pin is used to reset system. When it is asserted low, the board will reset . This pin is low active.
B2	Master_PCI_RST-	O	Master PCI Reset. This pin is used to reset Master PCI devices. When it is asserted low, all the Master PCI devices will be reset. This pin is low active,3.3V I/O pad.
B32	Slave_PCI_RST-	O	Slave PCI Reset. This pin is used to reset Slave PCI devices. When it is asserted low, all the Slave PCI devices will be reset. This pin is low active,3.3V I/O pad.

USB interface (4 pins)

PIN#	Function	TYPE	Description
A77	USBD1-	I/O	Universal Serial Bus Controller 0 Port 1. These are the serial data pair for USB Port 1. 15k Ω pull down resistors are connected to DP and DM internally.
A75	USBD1+		
A78	USBD2-	I/O	Universal Serial Bus Controller 0 Port 2. These are the serial data pair for USB Port 2. 15k Ω pull down resistors are connected to DP and DM internally.
A76	USBD2+		

PCIe interface (12 pins)

PIN#	Function	TYPE	Description
A72	PE0_RX-	I	PCI-E Differential serial data input. +: positive; -:negative
A70	PE0_RX+		
A71	PE0_TX-	O	PCI-E Differential serial data output. +: positive; -: negative
A69	PE0_TX+		
A68	PE0_CLK-	O	PCI-E Differential Clock 100MHz from Internal PLL +: positive; -: negative
A66	PE0_CLK+		
A67	PE1_RX-	I	PCI-E Differential serial data input. +: positive; -:negative
A65	PE1_RX+		
A63	PE1_TX-	O	PCI-E Differential serial data output. +: positive; -: negative
A61	PE1_TX+		
A62	PE1_CLK-	O	PCI-E Differential Clock 100MHz from Internal PLL +: positive; -: negative
A60	PE1_CLK+		

Programmable I/O interface (124 pins)

Pin#	Function	Type	Description
B75~B82	GP0[7:0]	I/O	Programmable Port 0[7:0] . Pin function is select by Programmable mechanism. This port support Programmable Bit Mux select by group.
B67~B74	GP1[7:0]	I/O	Programmable Port 1[7:0] . Pin function is select by Programmable mechanism. This port support Programmable Bit Mux select by group.
B58~B65	GP2[7:0]	I/O	Programmable Port 2[7:0] . Pin function is select by Programmable mechanism. This port support Programmable Bit Mux select by group.
B50~B57	GP3[7:0]	I/O	Programmable Port 3[7:0] . Pin function is select by Programmable mechanism. This port support Programmable Bit Mux select by group.
A4~A7	GP4[3:0]	I/O	Programmable Port 4[3:0] . Pin function is select by Programmable mechanism. This port support Programmable Bit Mux select by group.
A8~A15	GP5[7:0]	I/O	Programmable Port 5[7:0] . Pin function is select by Programmable mechanism. This port support Programmable Bit Mux select by group.
B41~B48	GP6[7:0]	I/O	Programmable Port 6[7:0] . Pin function is select by Programmable mechanism. This port support Programmable Port Mux select by group.

B33~B40	GP7[7:0]	I/O	Programmable Port 7[7:0] . Pin function is select by Programmable mechanism. This port support Programmable Port Mux select by group.
B24~B31	GP8[7:0]	I/O	Programmable Port 8[7:0] . Pin function is select by Programmable mechanism. This port support Programmable Port Mux select by group.
B16~B23	GP9[7:0]	I/O	Programmable Port 9[7:0] . Pin function is select by Programmable mechanism. This port support Programmable Port Mux select by group.
B7~B14	GPA[7:0]	I/O	Programmable Port A[7:0] . Pin function is select by Programmable mechanism. This port support Programmable Port Mux select by group.
A17~A24	GPB[7:0]	I/O	Programmable Port B[7:0] . Pin function is select by Programmable mechanism. This port support Programmable Port Mux select by group.
A25~A32	GPC[7:0]	I/O	Programmable Port C[7:0] . Pin function is select by Programmable mechanism. This port support Programmable Port Mux select by group.
A34~A41	GPD[7:0]	I/O	Programmable Port D[7:0] . Pin function is select by Programmable mechanism. This port support Programmable Port Mux select by group.
A42~A49	GPE[7:0]	I/O	Programmable Port E[7:0] . Pin function is select by Programmable mechanism. This port support Programmable Port Mux select by group.
A51~A58	GPF[7:0]	I/O	Programmable Port F[7:0] . Pin function is select by Programmable mechanism. This port support Programmable Port Mux select by group.

Digital ground (10 pins)

Pin#	Function	Type	Description
A2, A33, A50, A59, A73, A79, B15, B49, B66, B83	GND	G	Digital Ground

LAN interface (4 pins)

Pin#	Function	Type	Description
A83	LANTX-	O	TXN: 10B-T/100BT transmitting output pin/ receiving input pin (negative)
A81	LANTX+	O	TXP: 10B-T/100BT transmitting output pin/ receiving input pin (positive)
A84	LANRX-	I	RXN: 10B-T/100BT receiving input pin/ transmitting output pin (negative)
A82	LANRX+	I	RXP: 10B-T/100BT receiving input pin/ transmitting output pin (positive)

ADC interface (12 pins)

Pin#	Function	Type	Description
A4~A7	ADC0_[3:0]	I	ADC0 analog input
A8~A15	ADC1_[7:0]	I	ADC1 analog input

ADC power (2 pins)

Pin#	Function	Type	Description
-	AGND	G	Analogue Ground for ADC

Battery power (1 pin)

Pin#	Function	Type	Description
B84	VBATT	P	Battery power for RTC (Real Time Clock)

5V power input (2 pins)

Pin#	Function	Type	Description
A1,A3	VCC	P	5V Power input.

3.3V power input (1 pins)

Pin#	Function	Type	Description
A16	VCC3_OUT	P	3.3V Power output. Maximum output: 400mA. Some devices on carrier board which need 3.3 V.

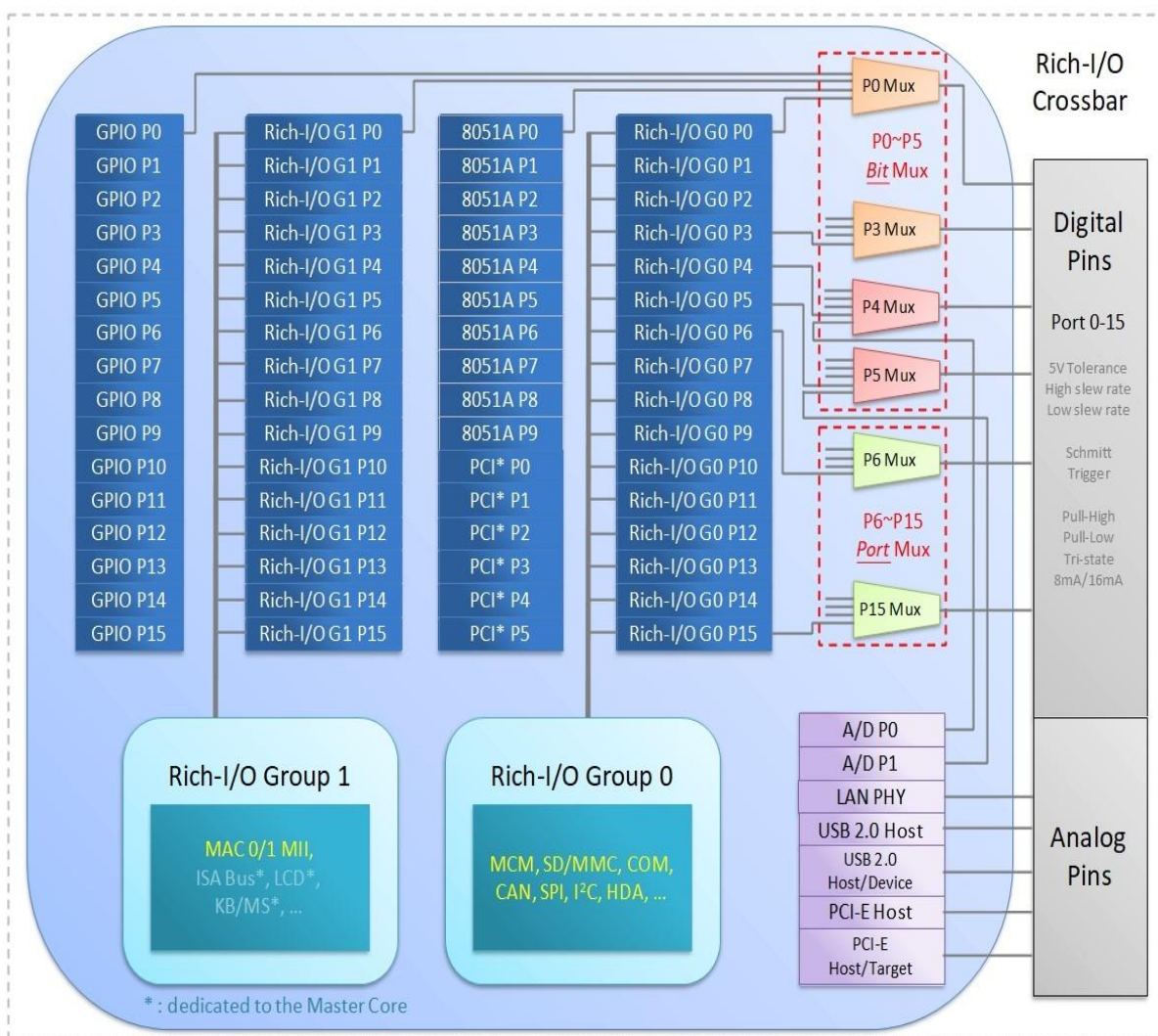
1.8V power output (1 pin)

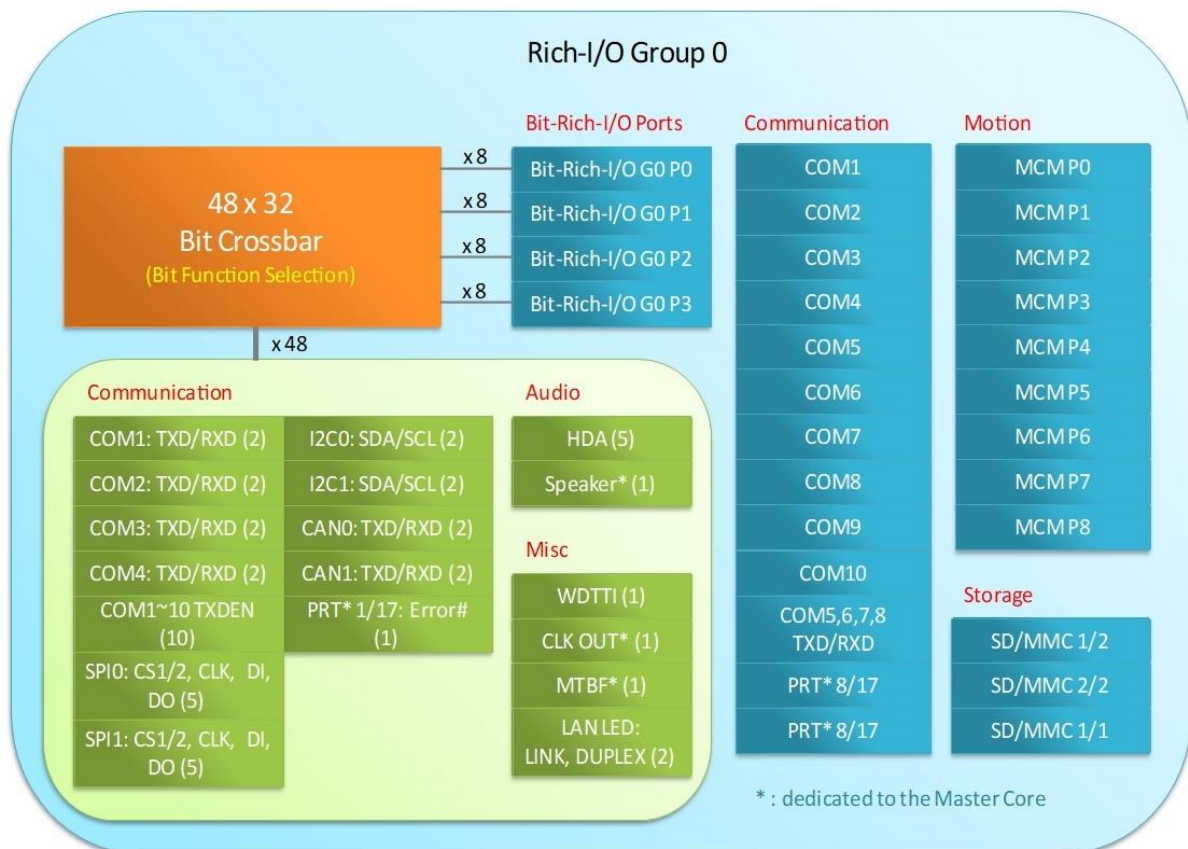
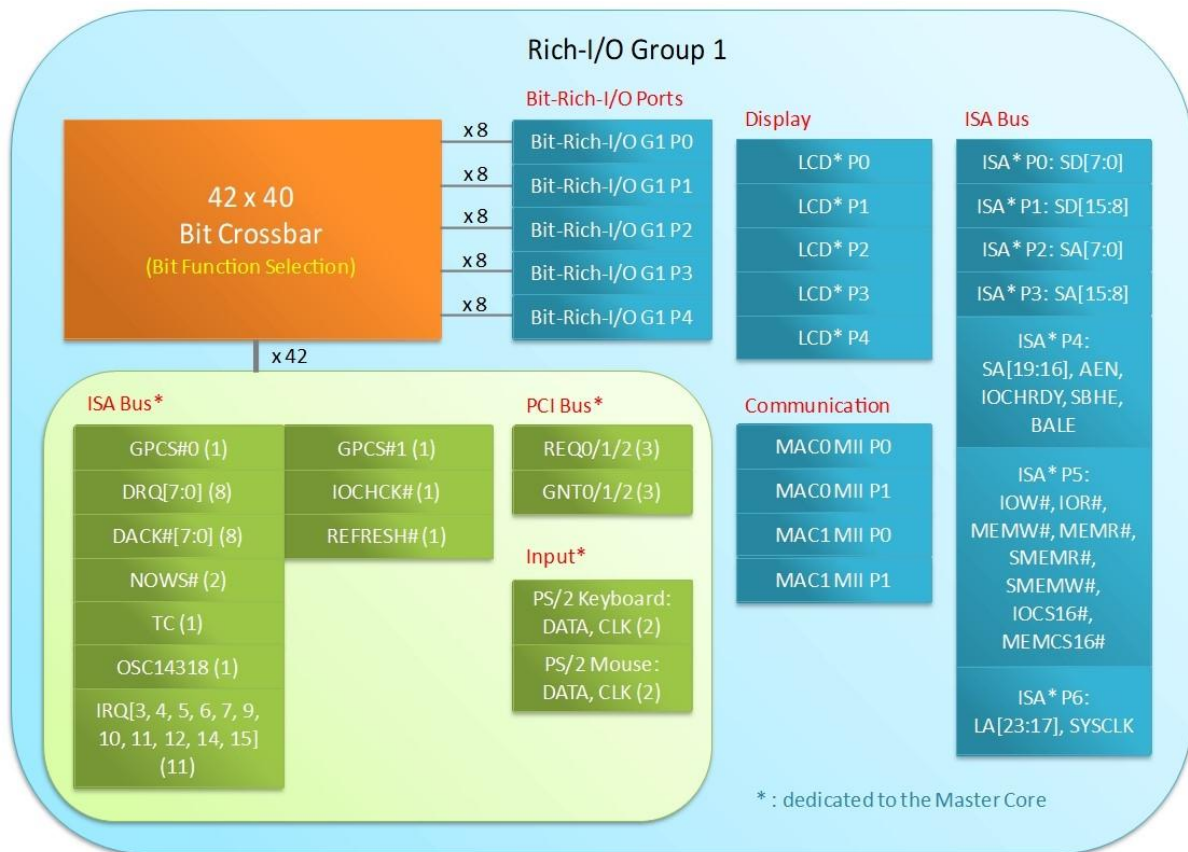
Pin#	Function	Type	Description
A80	VCC1.8_OUT	P	1.8V Power output. Maximum output: 400mA. Some devices on carrier board which need 1.8V.

3 Programmable I/O Selection

There are 16 ports which contain 124 pins I/O which are available freely to be assigned by you to meet your demand.

3.1 Programmable I/O overview





GPIO P0~P15 、 8051A P0~P9 :

Above is Port I/O, each port has 8 pins, if you need 8 bits of GPIO, just simply choose those Port I/O. The 8051A functions are not opened for users because the internal 8051A already simulated 8051A as Keyboard Controller in BIOS.

Port0~Port5 Bit Mux :

Port 0 to Port5 are Bit Mux, which means every single bit can be selectable from Rich-I/O G0 or Rich-I/O G1.

Port6~Port15 Port Mux :

Port 6 to Port 15 are Port Mux, which means the whole port can only be selected to one function. For example, select the whole port for GPIO, but not 4 pins for GPIO and other 4 pins for other function.

3.2 Selection Table for I/O Function

As mentioned in this user manual, there are 124 I/O pins which allow you to configure as specific functions you would like to use. In order to the I/O configuration for you, please complete the I/O selection table blow and mail to us.

Function	Description	Requested Numbers	Unit
GPIO	General Purpose Input/Output		Bit
UART	16C550/16C552 compatible		Port
UART (with TX and RX only)	UART with only TX/RX pin		Pair
UART TXDEN	RS485 Auto direction control		Bit
ISA	selectable for 8/16 bit and all other signals		Bit/ Port
Printer	Printer Port		Port
SD/eMMC	SD/eMMC		Port
SPI	Serial Peripheral Interface		Port
CAN	Controller Area Network		Port
I ² C	Inter-Integrated Circuit		Port
LAN LED	Link and Duplex LED for build-in Ethernet		Bit
Keyboard	PS/2 Keyboard		Port
Mouse	PS/2 Mouse		Port
WDTOUT	WatchDog timeout signal		Bit
CLKOUT	Clock output select from 14.318MHz /24MHz / 25MHz ISA Clock		Bit
MTBF	MTBF flag output		Bit
HD Audio	High Definition Audio		Port

4 Software Resources

4.1 BIOS

VEX2-DIP168 stores the BIOS in the Vortex86EX2 build-in SPI flash. The default BIOS is CoreBoot BIOS for the users who would like to edit/maintain by themselves; user can download the source from www.coreboot.org.

ICOP also provides the CoreBoot BIOS service for VEX2-DIP168 users who need quick boot (0.3 seconds) for their own specific applications. Please check with ICOP Sales for detail.

4.2 Software

The Vortex86EX2 is a x86 compatible CPU, it supports the legacy operating systems which support 486. Below is the support list.

- DOS
- Linux (Kernel 2.6.24 or later, i486 mode)
- Windows CE 5.0, CE 6.0, Compact 7
- VxWorks 5.5 & 6.8
- QNX 6.3.2 (BSP with driver source, users should migrate 6.4 or 6.5 by themselves).
- FreeBSD, OpenBSD and NetBSD.
- Other real time OS has 486 support, for example RTOS-32.

5 ADC

5.1 ADC overview

The ADC is an 12-bit, 2MS/s analog-to-digital converter. This ADC adopts successive approximation register (SAR) architecture. The input range is between 0 and VCCA (3.3V) and operating voltage range is between 2.97V and 3.63V.

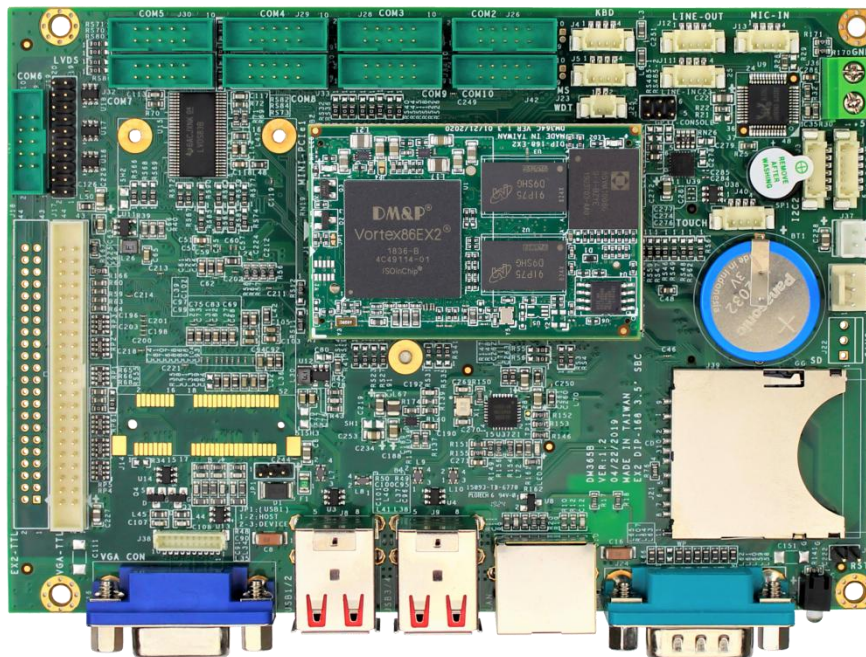
5.2 ADC Sample code

For more detail regarding ADC and its sample code, please contact your ICOP sales representative.

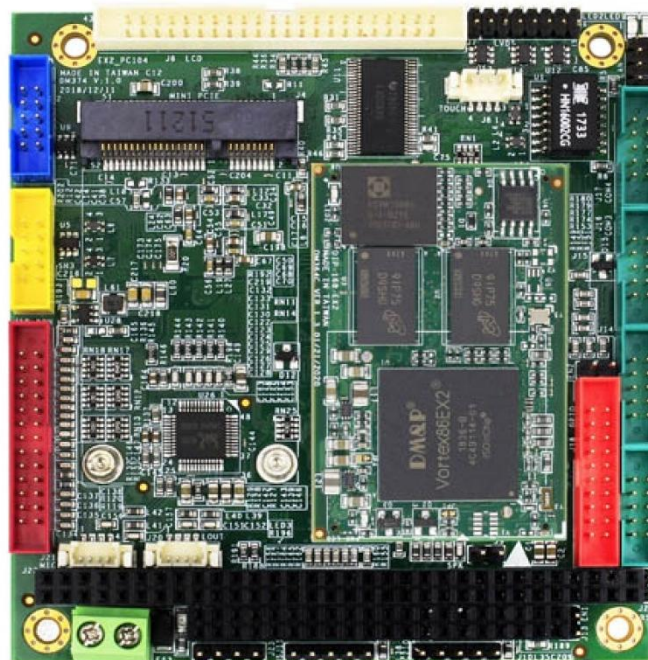
6 Evaluation Board

Please consider following three VEX2 series SBC from ICOP for evaluation.

VEX2-6427: VEX2 3.5" SBC



VEX2-6454: VEX2 PC/104 SBC



VEX2-6415: VEX2 Tiny SBC



Please contact your ICOP sales representative for detail.

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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