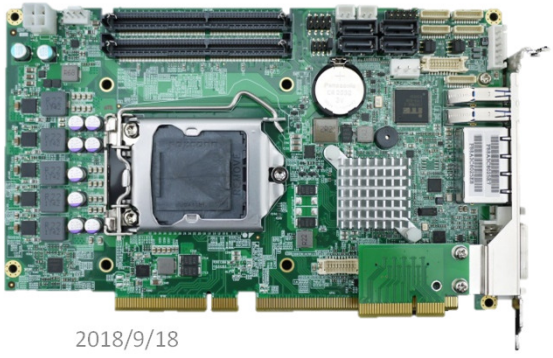
PIC 688
User Manual

PICMG 1.3 Half Size CPU Board



CADMUS *ELECTRONIC CO., LTD.*

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Preface

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Acknowledgements

RoHS Compliance

Cadmus certifies that our products including (but not limited to) components, semi-finished products, finished products, raw materials and packaging materials are in compliance with Directive 2011/65/EU of the European Parliament related to the restriction of the use of certain hazardous substances in electrical and electronics equipment (RoHS Directives).

RoHS restricts the use of Lead (Pb) < 0.1% or 1,000ppm, Mercury (Hg) < 0.1% or 1,000ppm, Cadmium (Cd) < 0.01% or 100ppm, Hexavalent Chromium (Cr6+) < 0.1% or 1,000ppm, Polybrominated biphenyls (PBB) < 0.1% or 1,000ppm, and Polybrominated diphenyl Ethers (PBDE) < 0.1% or 1,000ppm.

Package Contents

Before continuing, verify that the PIC 688 package that you received is complete. Your package should have all the items listed in the following table.

Item	Part Number	Name	Description	Qty
1	343280000104	USB cable x2 port with bracket	CABLE2xUSB AF-6P(2.5) L=240mm	1
2	343820030002	Supportive power cable	CABLE;3P-3P P=3.96mm L=120mm	1
3	343220070017	Standard SATA cable	CABLE;SATA W/LOCK 7P L=450mm	1
4		ETX board (Q170 and C236 only)	ETX board for high speed interface, with bracket	1

If any of these items are missing or damaged, contact your distributor or sales representative immediately. We have carefully inspected the PIC 688 mechanically and electrically before shipment. It should be free of marks and scratches and in perfect working order upon receipt. As you unpack the PIC 688, check it for signs of shipping damage. (For example, damaged box, scratches, dents, etc.)
If it is damaged or it fails to meet the specifications, notify our service department or your local sales representative immediately. Also notify the carrier. Retain the shipping carton and packing material for inspection by the carrier. After inspection, we will make arrangements to repair or replace the unit.

Optional Accessories

Item	Part Number	Name	Description
1	343820040003	4 pin power cable	CABLE;ATX POWER L=150mm BLK/Y
2	343220090003	COM port cable with bracket	9P COM port cable x2 Port L:200mm
3	343100002801	PS2 cable	Mini DIN 6P L:250mm
4	343220250018	Print port cable with Bracket	DB25P L:250mm
5	343420000010	DP cable with bracket	DP20P L:250mm
6	32607L07AB01	CPU cooler INTEL LGA1156	84L×84W×26.4H DC12V 0.45A 5500RPM±10%
7	8850RBU23001	RB-U23 USB2.0 Hub Kit	USB2.0 Hub Cable Kit, up to 5 USB2.0 ports
8	343420000010	DP cable	DP cable with bracket DP20P L:250mm

Ordering information

PIC688C
- PICMG 1.3 Half SBC, C236, Intel® LGA1151 , DDR4 SODIMM, DVI x1, LAN x2, USB3.0 x2, SATA3.0 x4, ETX board.

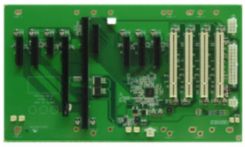
PIC688Q
- PICMG 1.3 Half SBC, Q170, Intel® LGA1151 , DDR4 SODIMM, DVI x1, LAN x2, USB3.0 x2, SATA3.0 x4, ETX board.

PIC688H
- PICMG 1.3 Half SBC, H110, Intel® LGA1151 , DDR4 SODIMM, DVI x1, LAN x2, USB3.0 x2, SATA3.0 x4.

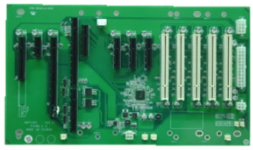
Backplane Selection Guide

		NBP1468	NBP1465	NBP1037	NBP1257	NBP1052	NBP05P2
PIC688-H		-	-	-	Support	-	Support
PIC688-Q		Support	Support	Support	-	Support	Support
PIC688-C		Support	Support	Support	-	Support	Support
Slot	PCIex16	1	1	1	1	2	2
	PCIe x 8	-	1	1	-	-	-
	PCIe x 4	5	3	3	-	3	1
	PCIe x 1	1	1	2	4	-	-
	PCI	4	5	-	7	2	2

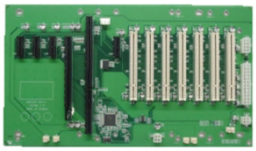
NBP1468 14 slot



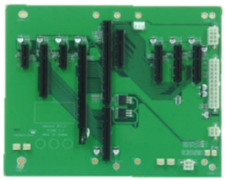
NBP1465 14 slot



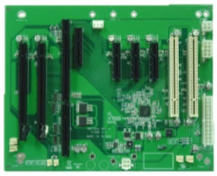
NBP1257 14 slot



NBP1037 10 slot



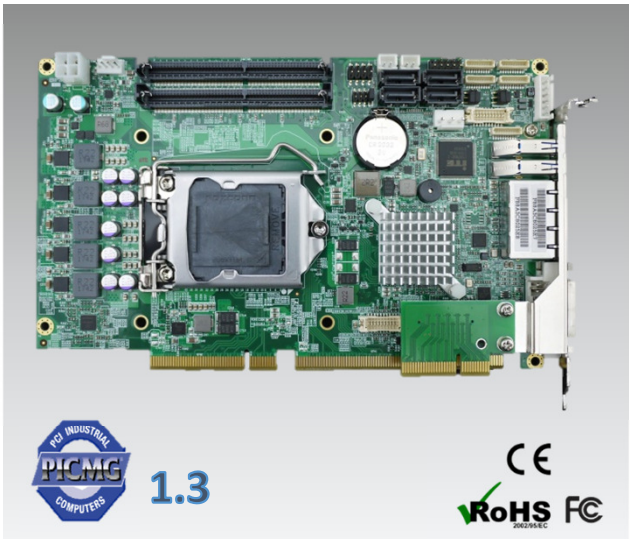
NBP1052 10 slot



Processor Support

		6th Gen. Skylake-S platform				7th Gen. Kobe lake-S platform			
Model	Cadmus P/N	CPU processor	Base Freq.	Cores	TDP	CPU processor	Base Freq.	Cores	TDP
PIC688-H PIC688-Q	8850PIC688H0 8850PIC688Q0	i7-6700	3.4 Ghz	4C	65W	I7-7700	3.6Ghz	4C	65W
		i7-6700TE	2.4 Ghz	4C	35W	I7-7700T	2.9GHz	4C	35W
		i5-6500	3.2 GHz	4C	65W	I5-7500	3.4Ghz	4C	65W
		i5-6500TE	2.3 GHz	4C	35W	I5-7500T	2.7Ghz	4C	35W
		i3-6100	3.7 GHz	2C	51W	I3-7101E	3.9Ghz	2C	54W
		i3-6100TE	2.7 GHz	2C	35W	I3-7101TE	3.4Ghz	2C	35W
		G4400	3.3 GHz	2C	54W				
		G4400TE	2.4 GHz	2C	35W				
		G3900	2.7 Ghz	2C	65W	G3930E	2.0Ghz	2C	54W
		G3900TE	2.2 Ghz	2C	35W	G3930TE	2.7Ghz	2C	35W
PIC688-C	8850PIC688C0	E3-1275 v6	4.2 Ghz	4C	73W	E3-1275 v6	4.2 Ghz	4C	73W
		E3-1275 v5	3.6 Ghz	4C	80W				
		E3-1268L v5	2.4 Ghz	4C	35W				
		E3-1225 v5	3.3 Ghz	4C	80W				

Chapter 1: Product Introduction



Main Features

- Complies with PCIMG1.3 standard
- Intel® Xeon/ Intel® Core™ i7/i5/i3 LGA1151 processor with 100 Series chipset
- Up to 32 GB of dual-channel DDR4 1866/2133 MHz
- Support NvMe Storage (PCIe Gen3 interface)
- PCIe 3.0, USB 3.0, SATA 3.0
- Supports triple display
- Supports TPM
- Multiple PCIe Gen3 Lanes , up to 30 port PCIe lanes

Note :
Intel 7th generation processors only support Windows 10 (64-bit).

Product Overview

The PIC 688 is a PICMG1.3 Half-size Single-Board Computing .It equipped with Intel® 6th /7th generation Core™ i7/i5/i3 processors and Intel® H110 / Q170/ C236 chipset. It comes with Dual DDR4 DIMM socket up to 32GB DDR4 1866/2133MHz with Non-ECC support and integrated HD Graphic controller.

PIC 688Q SKU with Intel® Q170 PCH providing high performance and rich expansion , support 30 PCIe lanes(Gen3) , provide flexible expansion design on backplane and high customization options.

Specifications

CPU Support
- 6th /7th generation Intel® Xeon and Intel® Core™ i7/i5/i3 processor (65W/35W) TDPs, Socket LGA1151

Main Memory
- 2 x SODIMM, support Dual channel DDR4 Non-ECC SODIMM 1866/2133 MT/S (Maximum 32GB)

Platform Control Hub
- Intel®H110 / Q170 / C236 Express Chipset PCH

Display
Support independent triple display
- DVI-I(VGA): Resolution up to 1920*1200 pixels @60MHz
- DVI-D(HDMI): Resolution up to 4096*2304 pixels @60MHz
- DP: Resolution up to 4096*2304 pixels @60MHz

On board LAN
- 1 x Intel®WG1219LM GbE PHY
- 1 x Intel®I211 Gigabit Ethernet Controller
- Support Boot from LAN (PXE)
- Support Wake on LAN

Front I/O
- USB3.0 *2 port
- RJ45*2 port
- DVI-I *1 port

On board I/O
- 4 x SATA port Support RAID 0/1/5/10
- DP port with 20pin Connector

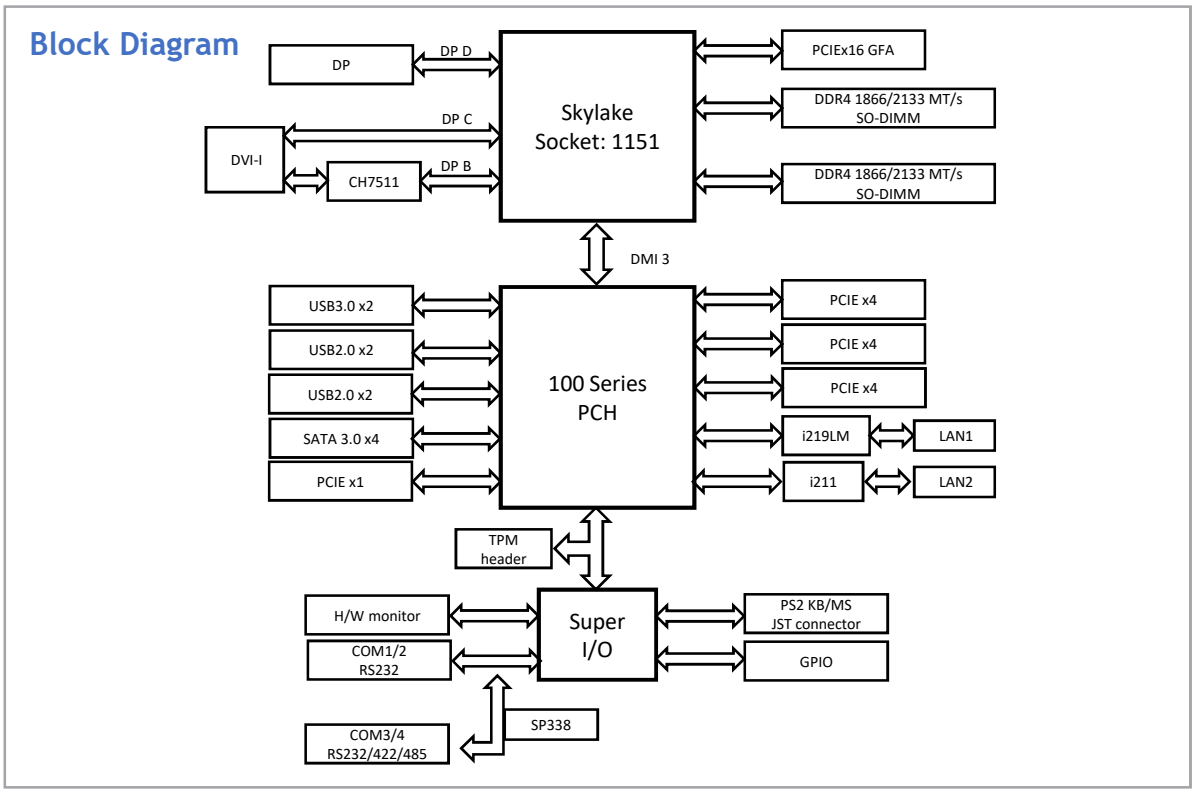
SIO: ITE8786
- COM 1,2, Support RS232 with single mini type connector, support 5V. (refer to pin define)
- COM3,4 Support switchable RS232/422/485
- PS2 KB/MS *1 JST connector
- 4 Ports USB2.0
- 1 x DIO (8 in , 8 out)
- 1 x Smart FAN connector for CPU

Environment
- Board level operating temperatures: -20°C to 60°C
- Storage temperatures: -20°C to 85°C

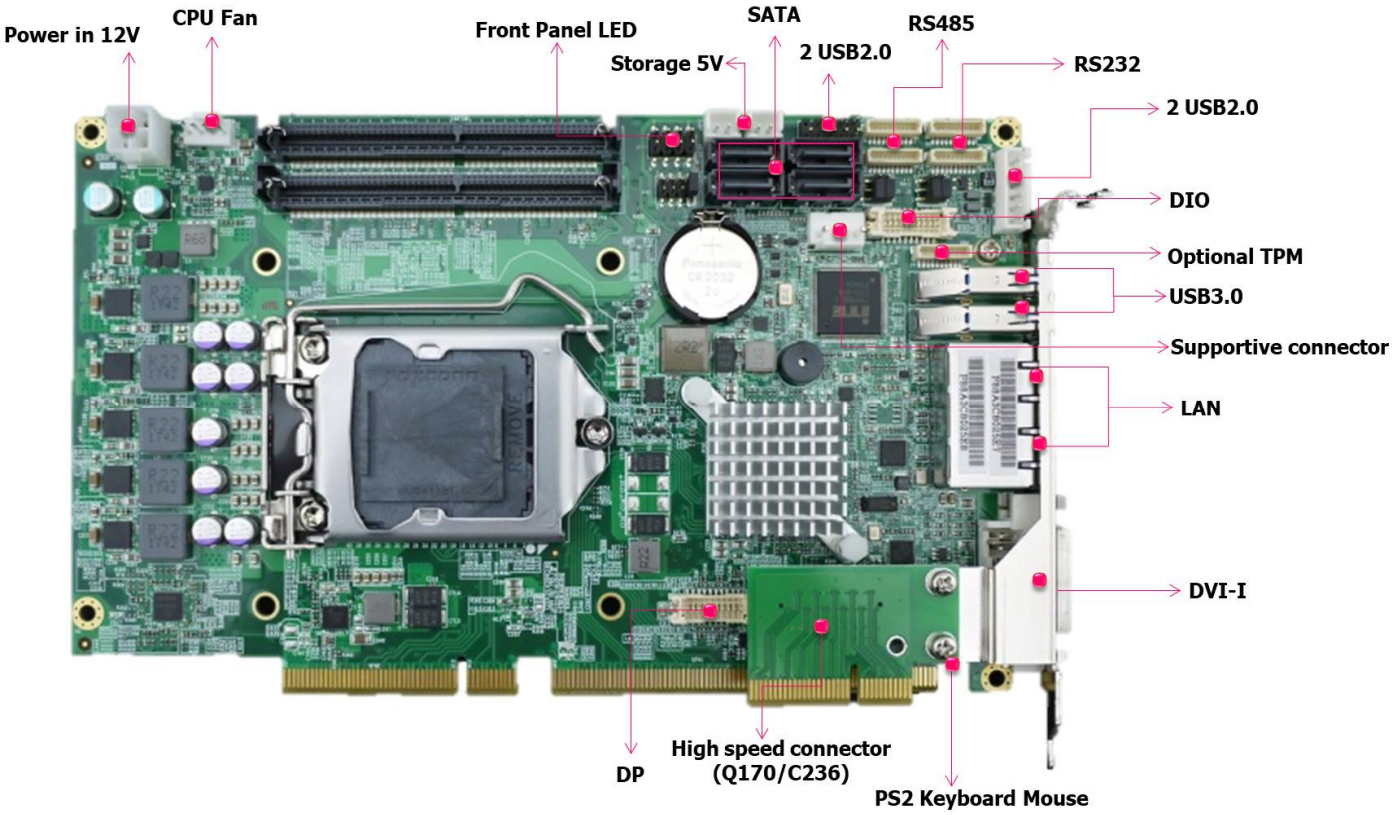
Relative humidity:
- 0% to 90% (operating, non-condensing)
- 0% to 95% (non-operating, non-condensing)

Certifications
- CE approval
- FCC Class A

Block Diagram

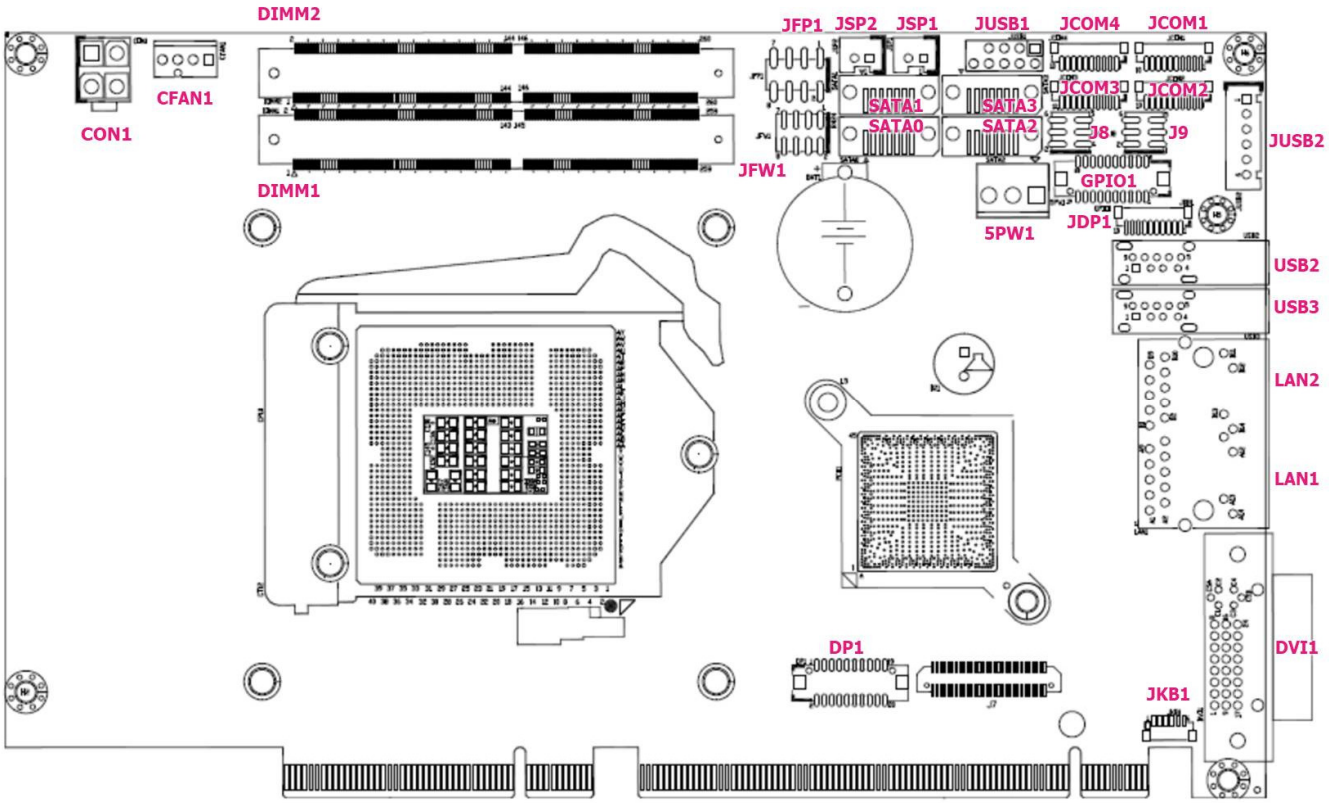


Knowing Your PIC688



Chapter 2: Jumpers and Connectors

Locations of the Jumpers and Connectors

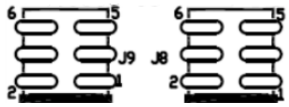


Jumpers

CMOS Clear Select Connector location:JFW1 / Pitch :2.0mm

Pin	Settings
1-2 On	*Normal
2-4 On	Clear BIOS Setting

COM 3 / COM4 Select Connector location: J8 (COM3) / J9 (COM4)
Pitch :2.0mm

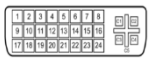


Select Type	RS232	RS485	RS422
JB/J9	1-3	3-5	1-3
	2-4	4-6	4-6

Connector Pin Definitions - External Connectors

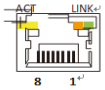
DVI-I

Connector location: DVI U23



Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	DVIdata 2-	9	DVIdata 1-	17	DVIdata 0-	C1	Analog Red
2	DVIdata 2+	10	DVIdata 1+	18	DVIdata 0+	C2	Analog Green
3	GND	11	GND	19	GND	C3	Analog Blue
4	CRT DDC clock	12	N/C	20	VGA_SCL	C4	Analog horiz. Sync
5	CRT DDC data	13	N/C	21	VGA_SDA	C5	Analog GND
6	DVIDC clock	14	5V	22	NC		
7	DVIDC data	15	GND	23	DVI clock +		
8	Analog vert. sync	16	Hot piug detect	24	DVI clock -		

LAN1 / LNA2 (LED)

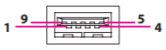


Connector location: LAN1 / LAN2

Pin	Definition	Pin	Definition
1	LAN_MDI0P	2	LAN_MDI0N
3	LAN_MDI1P	4	LAN_MDI1N
5	LAN_MDI2P	6	LAN_MDI2N
7	LAN_MDI3P	8	LAN_MDI3N

USB3.0

Connector location: USB2 / USB3



Pin	Definition	Pin	Definition
1	P5V_OC01_C	2	USB_0N_C
3	USB_0P_C	4	GND
5	USB3_RX1_N_C	6	USB3_RX1_P_C
7	GND	8	USB3_TX1_N_C
9	USB3_TX1_P_C		

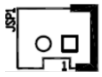
Connector Pin Definitions - Internal Connectors

Power input connector

Connector location : CON1

Pin	Definition	Pin	Definition
1	GND	2	GND
3	+12V	4	+12V

SATA HDD power Connector



Connector location : JSP1 / JSP2

Pin	Definition	Pin	Definition
1	5V	2	GND

CPU fan connector

Connector location : CFAN1

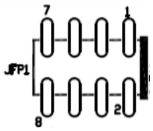
Pin	Definition	Pin	Definition
1	GND	2	+12V
3	FAN TAC	4	FAN CTL

SATA connector

Connector location :
SATA0/ SATA1 / SATA2 /SATA3

Pin	Definition	Pin	Definition
1	GND	2	SATA_TXP1
3	SATA_TXN1	4	GND
5	SATA_RXN1	6	SATA_RXP1
7	GND		

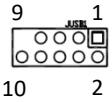
Front panel Pin Header



Connector location : JFP1

Pin	Definition	Pin	Definition
1	SATA_LED+	2	PWR_LED+
3	SATA_LED-	4	GND
5	GND	6	PWR_BTN
7	RESET_BTN	8	GND

USB2.0



Connector location: JUSB1

Pin	Definition	Pin	Definition
1	Power 5V	2	Power 5V
3	USB1 DX-	4	USB2 D-
5	USB1 DX+	6	USB2 D+
7	GND	8	GND
9	N/A	10	N/A

Supportive Power Connector

Connector location : SPW1

Pin	Definition	Pin	Definition
1	5V	2	GND
3	5V		

Connector Pin Definitions - Internal Connectors

COM port

Connector location :
COM1/ COM2
Pitch : 1.0mm

Pin	Definition	Pin	Definition
1	COM_DCD	2	COM_RXD
3	COM_TXD	4	COM_DTR
5	GND	6	COM_DSR
7	COM_RTS	8	COM_CTS
9	COM_RI	10	VCC5

LPC Connector (optional TPM)

Connector location : JDB1
Pitch : 1.0mm

Pin	Definition	Pin	Definition
1	GND	2	RST_SIO
3	CLK_PCI_P80	4	LPC_FRAME
5	LPC_AD3	6	LPC_AD2
7	LPC_AD1	8	LPC_AD0
9	LPC_SERIRQ	10	VCC3

COM port

Connector location :
COM3 / COM4
Pitch : 1.0mm
Jumper select : J8/J9 (see P.8)

RS232 mode :

Pin	Definition	Pin	Definition
1	COM_DCD	2	COM_RXD
3	COM_TXD	4	COM_DTR
5	GND	6	COM_DSR
7	COM_RTS	8	COM_CTS
9	COM_RI	10	VCC5

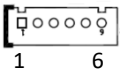
RS422 mode :

Pin	Definition	Pin	Definition
1	TX-	2	TX+
3	RX+	4	RX-
5	GND	6	
7		8	
9		10	

RS485 mode :

Pin	Definition	Pin	Definition
1	DATA-	2	DATA+
3		4	
5	GND	6	
7		8	
9		10	

USB2.0



Connector location: JUSB2

Pin	Definition	Pin	Definition
1	P5V_OC45_C	2	USB4-
3	USB4+	4	USB5-
5	USB5+	6	GND

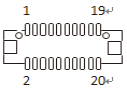
PS2 Keyboard Mouse

Connector location : JKB1
Pitch :1.0mm

Pin	Definition	Pin	Definition
1	KM_VCC5	2	KBDAT
3	KBCLK	4	MS_DAT
5	MS_CLK	6	GND

Connector Pin Definitions - Internal Connectors

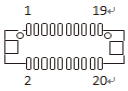
DP



Connector location : DP1

Pin	Definition	Pin	Definition
1	DPD_PWR_R	2	DPD_PWR_R
3	GND	4	GND
5	DDI3_TXN_R1	6	DDI3_TXN_R3
7	DDI3_TXP_R1	8	DDI3_TXP_R3
9	GND	10	GND
11	DDI3_TXN_R0	12	DDI3_TXN_R2
13	DDI3_TXP_R0	14	DDI3_TXP_R2
15	GND	16	GND
17	DPD_AUX_P_R	18	DPD_HPD_R
19	DPD_AUX_N_R	20	DP_GND

DIO



Connector location : GPIO1

Pin	Definition	Pin	Definition
1	GPO0	2	GPI0
3	GPO1	4	GPI1
5	GPO2	6	GPI2
7	GPO3	8	GPI3
9	GPO4	10	GPI4
11	GPO5	12	GPI5
13	GPO6	14	GPI6
15	GPO7	16	GPI7
17	VCC5	18	VCC5
19	GND	20	GND