COM Express™ PCOM-BA01VG

User's Guide

Preliminary Revision 0.1

Revision History

R0.1	Preliminary ZR1

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1 Introduction

This PCOM-BA01VG User's Guide contains detail information of the product specifications, features, mechanical dimensions, heat sink/cooler and BIOS Setup.

PCOM-BA01VG is designed according to COM (Computer on Module) PICMG Open Modular Computing Standards COM Express™ Specification Rev3.0 Type 10 and Basic form factor (84x55mm).

PCOM-BA01VG is designed with Intel 6th Generation processor code name Apollo Lake. PCOM-BA01VG is the successor of PCOM-BA00VG (Intel Baytrail platform) targeted on low power ATOM processors from TDP 6W to 12W fan less system and suitable for wide working temperature from -40 ° C to +80 ° C. PCOM-BA01 supports dual channel LPDDR4 memory up to 8GB and provides dual core and quad core options, base frequency 1.3GHz and 1.6GHz, with turbo boost up to 1.8 and 2.0GHz. HD Graphic supports triple independent 4K x 2K high resolution display.

2 Block Diagram

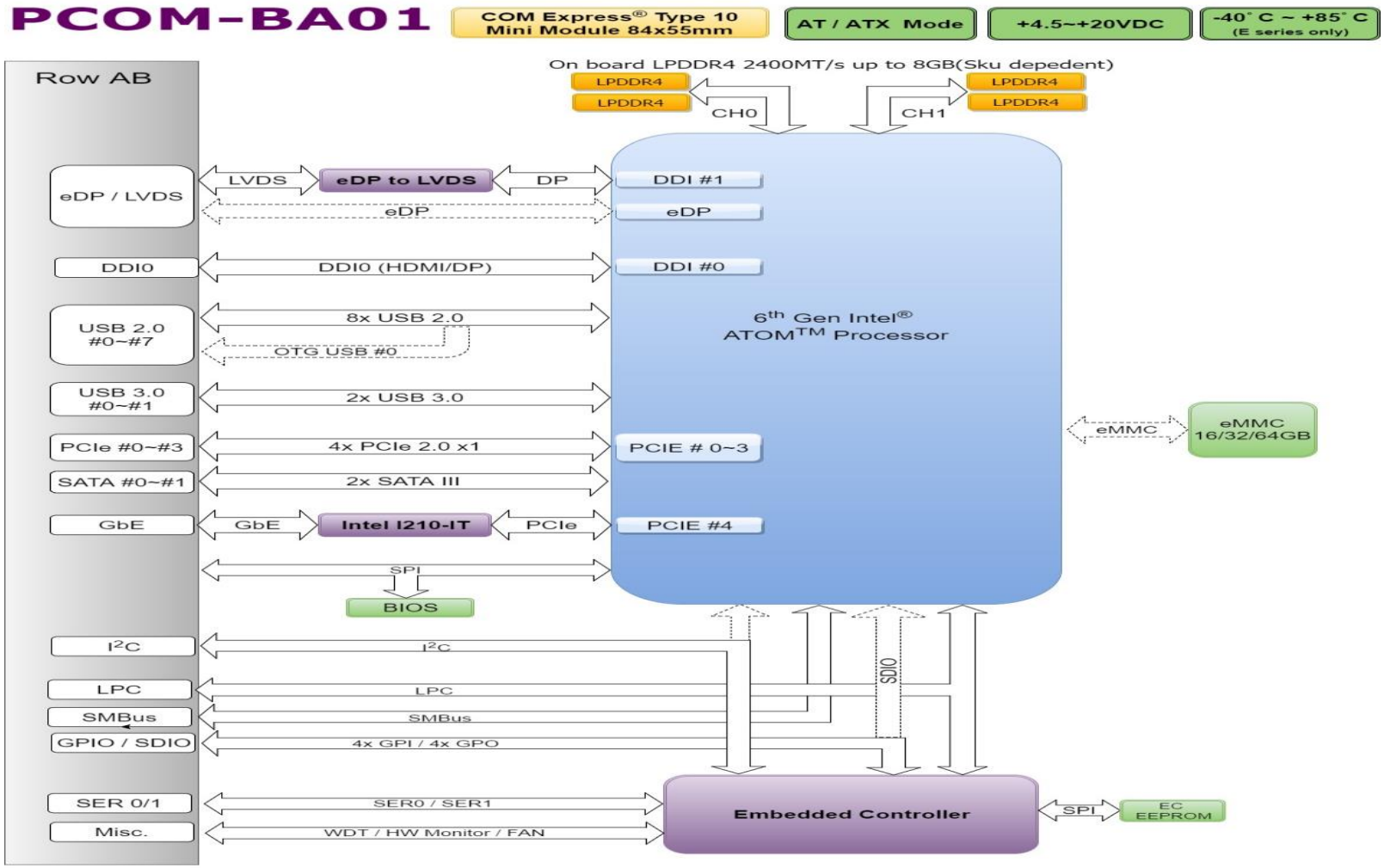

Figure 1 Block Diagram

3 Specifications

General	
Product	➢ PCOM-BA01VG
Form Factor	➢ Compact COM Express™ Type 10 Rev. 3.0
Processor	➢ Intel 6th Generation Apollo Lake (The processor list is listed as below)
Chipset	➢ SoC
BIOS	➢ AMI Aptio5 UEFI BIOS
Memory	➢ On board LPDDR4 Memory ➢ Dual channel ➢ Up to 8GB 2400MHz
I/O Interface	
Embedded Controller	➢ ITE8380 Embedded Controller, Voltage, Fan and Temperature
Serial IO	➢ 8 GPIO (4 GPI and 4 GPO) ➢ I2C (PCH & Embedded Controller) ➢ 2 Serial Ports (TX and RX Only) ➢ SMBus (SoC)
Processor PCI Express	➢ 1 PCI Express x4 (PEG) Gen2 (5.0 GT/s) ; (PCIE 0/1/2/3) can be configured to x1,x2,x4
USB	➢ 8 x USB2.0 (480 Mbps) (Port 0~7) ➢ USB OTG (Optional) (Port 7) ➢ 2 x USB3.0 (5 Gbps) (Port 0/1)
SATA	➢ 2 x SATA3.0 (6 Gbps) (Port 0/1)
Ethernet	➢ GbE Intel I210-IT -40°C to 80°C
SD	➢ 1 x SDIO 3.01 (Option)

Audio	➢ Intel® High Definition Audio
Display	
Graphic Controller	➢ Intel® HD Graphics 500 (Processor dependent) ➢ Intel® HD Graphics 505 (Processor dependent)
Graphics Options	➢ DP 1.2a 4096x2160@60Hz ➢ HDMI 1.4b 3840x2160@30Hz (Optional) ➢ LVDS 1366x768@112Hz
Mechanical & Environment	
Dimension	➢ COM Express™ standard pin out Type 10 Rev. 3.0/2.1 ➢ 84 x 55mm (Compact COM Express)
Hardware Monitors	➢ ITE8380 Embedded Controller, Voltage, Fan and Temperature
Power DC IN	➢ +12VDC (Nominal) ➢ + 6 VDC ~ + 18 VDC (Wide range)
Power Management	➢ ACPI 5.0
Environment	➢ Operating Temperature -40 ° C ~ +80 ° C (processor dependent) ➢ Storage Temperature -40 ° C ~ +80 ° C ➢ Relative Humidity 5%~95%
MTBF	➢ Over 100,000 hours at room ambient 40 ° C

Table 1 PCOM-BA01VG Specification

3.1 PCOM-BA01VG Processor list

PCOM-BA01VG Processor list

PCOM-BA01VG Series	PCOM-BA01VG	PCOM-BA01VG	PCOM-BA01VG	PCOM-BA01VG	PCOM-BA01VG
Processor Number	Intel® Celeron® N3350	Intel® Pentium® N4200	Intel® Atom™ x5-E3930	Intel® Atom™ x5-E3940	Intel® Atom™ x7-E3950
Essentials					
Processor Number	N3350	N4200	E3930	E3940	E3950
Lithography	14 nm	14 nm	14 nm	14 nm	14 nm
Performance					
# of Cores	2	4	2	4	4
# of Threads	2	4	2	4	4
Processor Base Frequency	1.10 GHz	1.10 GHz	1.30 GHz	1.60 GHz	1.60 GHz
Burst Frequency	2.40 GHz	2.50 GHz	1.80 GHz	1.80 GHz	2.00 GHz
Cache	2 MB L2	2 MB L2	2 MB L2	2 MB L2	2 MB L2
TDP	6 W	6 W	6.5 W	9.5 W	12 W
Memory Specifications					
Max Memory Size (dependent on memory type)	8 GB	8 GB	8 GB	8 GB	8 GB
Max # of Memory Channels	2	2	2	2	2
Graphics Specifications					
Processor Graphics	Intel® HD Graphics 500	Intel® HD Graphics 505	Intel® HD Graphics 500	Intel® HD Graphics 500	Intel® HD Graphics 505
Graphics Base Frequency	200.00 MHz	200.00 MHz	400.00 MHz	400.00 MHz	500.00 MHz
Graphics Burst Frequency	650.00 MHz	750.00 MHz	550.00 MHz	600.00 MHz	650.00 MHz
Graphics Video Max Memory	8 GB	8 GB	2 GB	2 GB	2 GB

DirectX* Support	Yes	Yes	Yes	Yes	Yes
OpenGL* Support	Yes	Yes	Yes	Yes	Yes
Intel® Quick Sync Video	Yes	Yes	Yes	Yes	Yes
Intel® Clear Video HD Technology	Yes	Yes	Yes	Yes	Yes
Intel® Clear Video Technology	Yes	Yes	Yes	Yes	Yes
# of Displays Supported	3	3	3	3	3
4K Support	Yes, at 60Hz	Yes, at 60Hz	Yes, at 60Hz	Yes, at 60Hz	Yes, at 60Hz
Max Resolution (HDMI 1.4)	3840x2160 @30Hz	3840x2160 @30Hz	3840x2160 @30Hz	3840x2160 @30Hz	3840x2160 @30Hz
Max Resolution (DP)	4096x2160 @60Hz	4096x2160 @60Hz	4096x2160 @60Hz	4096x2160 @60Hz	4096x2160 @60Hz
Max Resolution (eDP - Integrated Flat Panel)	3840x2160 @ 60Hz	3840x2160 @ 60Hz	3840x2160 @ 60Hz	3840x2160 @ 60Hz	3840x2160 @ 60Hz
Expansion Options					
PCI Express Revision	2.0	2.0	2.0	2.0	2.0
PCI Express Configurations	x4,x2,x1	x4,x2,x1	x4,x2,x1	x4,x2,x1	x4,x2,x1
Max # of PCI Express Lanes	4	4	4	4	4
I/O Specifications					
USB Revision	2.0/3.0	2.0/3.0	2.0/3.0	2.0/3.0	2.0/3.0
# of USB Ports	8	8	8	8	8
Total # of SATA Ports	2	2	2	2	2
Package Specifications					
TJUNCTION	105°C	105°C	110°C	110°C	110°C
Advanced Technologies					
Secure Boot	Yes	Yes	Yes	Yes	Yes

Intel® Virtualization Technology (VT-x)	Yes	Yes	Yes	Yes	Yes
Intel® Virtualization Technology for Directed I/O (VT-d)	Yes	Yes	Yes	Yes	Yes
Intel® VT-x with Extended Page Tables (EPT)	Yes	Yes	Yes	Yes	Yes
Intel® 64	Yes	Yes	Yes	Yes	Yes
Instruction Set	64-bit	64-bit	64-bit	64-bit	64-bit
Idle States	Yes	Yes	Yes	Yes	Yes
Enhanced Intel SpeedStep® Technology	Yes	Yes	Yes	Yes	Yes
Thermal Monitoring Technologies	Yes	Yes	Yes	Yes	Yes
Intel® HD Audio Technology	Yes	Yes	Yes	Yes	Yes
Intel® Identity Protection Technology	Yes	Yes	Yes	Yes	Yes
Intel® Data Protection Technology					
Intel® AES New Instructions	Yes	Yes	Yes	Yes	Yes
Secure Key	Yes	Yes	Yes	Yes	Yes
Intel® Platform Protection Technology					
Execute Disable Bit	Yes	Yes	Yes	Yes	Yes

Table 2 PCOM-BA01VG Processor list

3.2 Supported Operating Systems

The PCOM-BA01VG supports the following operating systems.

Vendor	Operating System	Supported
	Windows 10 (64bit)	Yes

Table 3 Supported Operating Systems

3.3 Electrical Characteristics

Input voltage	+12VDC (Nominal) + 6 VDC ~ + 18 VDC (Wide range)
RTC Battery	6 u A
Power on mode	AT / ATX

Table 4 Electrical Characteristics

3.4 Mechanical Dimensions

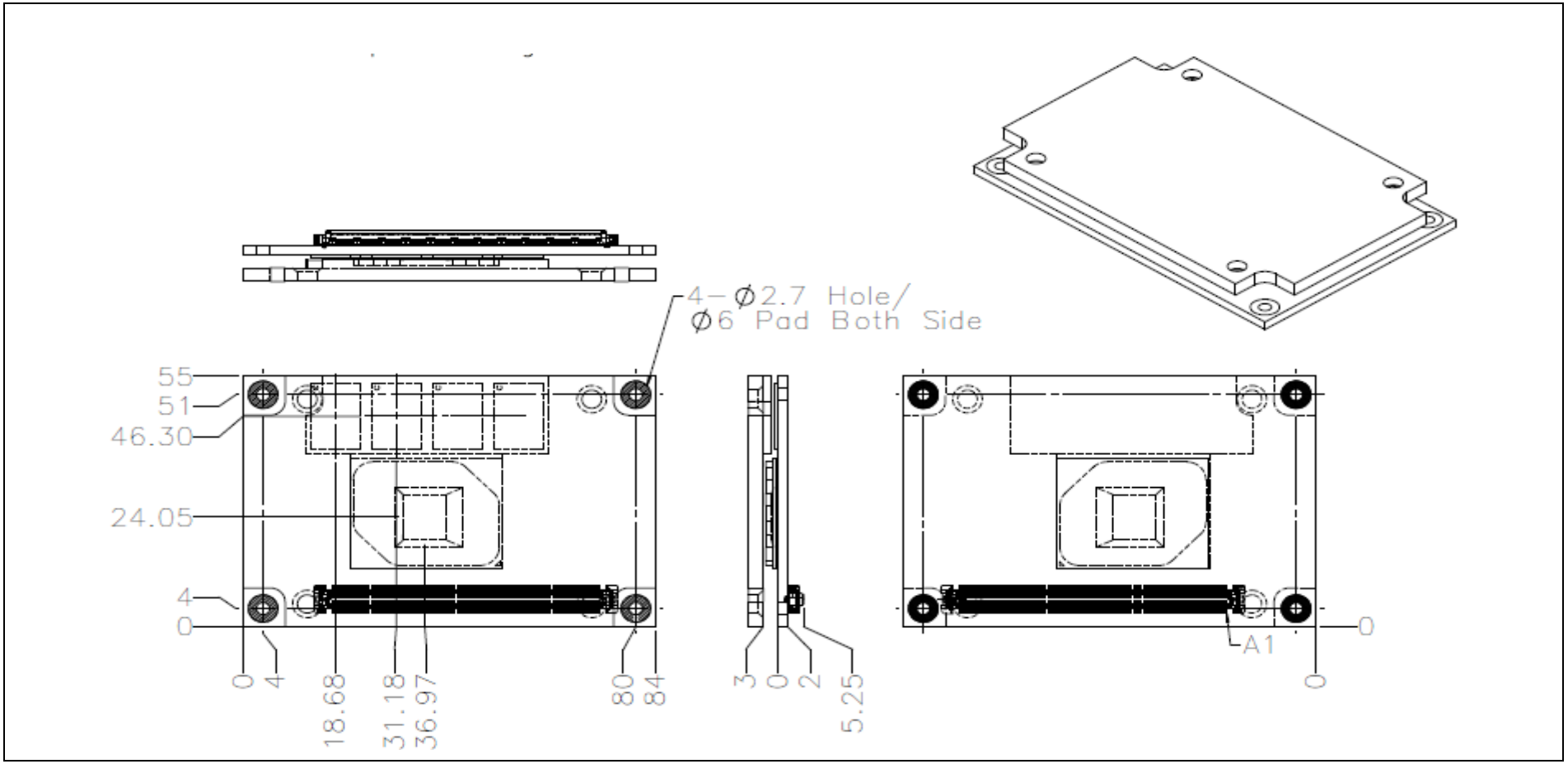

Figure 2 Mechanical Dimensions with Heat Spreader - Top/Bottom

Restricted component height on the top side of the module: 3 mm

Restricted component height on the bottom side of the module：3.8 mm

Do not place plugging component in the zone of restricted component height.

Do not place DIP type component in the zone of restricted component height.

3.5 Environmental Specifications

Storage Temperature	0~60°C
Operation Temperature	-40~80°C
Storage Humidity	0%~95%
Operation Humidity	0%~95%

Table 5 Environmental Specifications

4 Ordering Guide

PCOM-BA01VG

Product	Ordering P/N	Status
PCOM-BA01-E3950-4G	AB1-3G73Z	In Development
PCOM-BA01-E3940-4G	AB1-3G74Z	In Development
PCOM-BA01-E3930-8G	AB1-3G27Z	In Development

Table 6 Ordering Guide - PCOM-BA01VG

Accessory

Product	Ordering P/N	Status
PCOM-BA01VG Heat sink	TBD	In Development
PCOM-CA00	AB1-3917	Available

Table 7 Ordering Guide - Accessory

5 Pin out Tables

Below tables lists PCOM-BA01VG AB Row connectors Type 10 pin name, un-connected pins are present as RSVD.

Pin	Row A		Row B	
	PICMG Define	PCOM-BA01	**PICMG Define**	PCOM-BA01
1	**GND(FIXED)**	GND (FIXED)	**GND(FIXED)**	GND (FIXED)
2	**GBE0_MDI3-**	GBE0_MDI3-	**GBE0_ACT#**	GBE0_ACT#
3	**GBE0_MDI3+**	GBE0_MDI3+	**LPC_FRAME#/ESPI_CS0#**	LPC_FRAME#
4	**GBE0_LINK100#**	GBE0_LINK100#	**LPC_AD0/ESPI_IO_0**	LPC_AD0
5	**GBE0_LINK1000#**	GBE0_LINK1000#	**LPC_AD1/ESPI_IO_1**	LPC_AD1
6	**GBE0_MDI2-**	GBE0_MDI2-	**LPC_AD2/ESPI_IO_2**	LPC_AD2
7	**GBE0_MDI2+**	GBE0_MDI2+	**LPC_AD3/ESPI_IO_3**	LPC_AD3
8	**GBE0_LINK#**	GBE0_LINK#	**LPC_DRQ0#/ESPI_ALERT0#**	RSVD
9	**GBE0_MDI1-**	GBE0_MDI1-	**LPC_DRQ1#/ESPI_ALERT1#**	RSVD
10	**GBE0_MDI1+**	GBE0_MDI1+	**LPC_CLK/ESPI_CK**	LPC_CLK
11	**GND(FIXED)**	GND (FIXED)	**GND(FIXED)**	GND (FIXED)
12	**GBE0_MDI0-**	GBE0_MDI0-	**PWRBTN#**	PWRBTN#
13	**GBE0_MDI0+**	GBE0_MDI0+	**SMB_CK**	SMB_CK
14	**GBE0_CTREF**	GBE0_CTREF	**SMB_DAT**	SMB_DAT
15	**SUS_S3#**	SUS_S3#	**SMB_ALERT#**	SMB_ALERT#

Table 8 PCOM-BA01VG Pin-out 1-6

Pin	Row A		Row B	
	PICMG Define	PCOM-BA01	PICMG Define	PCOM-BA01
16	SATA0_TX+	SATA0_TX+	SATA1_TX+	SATA1_TX+
17	SATA0_TX-	SATA0_TX-	SATA1_TX-	SATA1_TX-
18	SUS_S4#	SUS_S4#	SUS_STAT#/ESPI_RESET#	SUS_STAT#
19	SATA0_RX+	SATA0_RX+	SATA1_RX+	SATA1_RX+
20	SATA0_RX-	SATA0_RX-	SATA1_RX-	SATA1_RX-
21	GND(FIXED)	GND (FIXED)	GND(FIXED)	GND (FIXED)
22	USB_SSRX0-	USB_SSRX0-	USB_SSTX0-	USB_SSTX0-
23	USB_SSRX0+	USB_SSRX0+	USB_SSTX0+	USB_SSTX0+
24	SUS_S5#	RSVD	PWR_OK	PWR_OK
25	USB_SSRX1-	USB_SSRX1-	USB_SSTX1-	USB_SSTX1-
26	USB_SSRX1+	USB_SSRX1+	USB_SSTX1+	USB_SSTX1+
27	BATLOW#	BATLOW#	WDT	WDT
28	SATA_ACT#	SATA_ACT#	HDA_SDIN2	RSVD
29	HDA_SYNC	HDA_SYNC	HDA_SDIN1	RSVD
30	HDA_RST#	HDA_RST#	HDA_SDIN0	HDA_SDIN0
31	GND(FIXED)	GND (FIXED)	GND(FIXED)	GND (FIXED)
32	HDA_BITCLK	HDA_BITCLK	SPKR	SPKR
33	HDA_SDOUT	HDA_SDOUT	I2C_CK	I2C_CK
34	BIOS_DIS0#/ESPI_SAFS	BIOS_DIS0#	I2C_DAT	I2C_DAT
35	THRMTRIP#	THRMTRIP#	THRM#	THRM#

Table 9 PCOM-BA01VG Pin-out 2-6

Pin	Row A		Row B	
	PICMG Define	PCOM-BA01	PICMG Define	PCOM-BA01
36	USB6-	USB6-	USB7-	USB7-
37	USB6+	USB6+	USB7+	USB7+
38	USB_6_7_OC#	USB_6_7_OC#	USB_4_5_OC#	USB_4_5_OC#
39	USB4-	USB4-	USB5-	USB5-
40	USB4+	USB4+	USB5+	USB5+
41	GND(FIXED)	GND (FIXED)	GND(FIXED)	GND (FIXED)
42	USB2-	USB2-	USB3-	USB3-
43	USB2+	USB2+	USB3+	USB3+
44	USB_2_3_OC#	USB_2_3_OC#	USB_0_1_OC#	USB_0_1_OC#
45	USB0-	USB0-	USB1-	USB1-
46	USB0+	USB0+	USB1+	USB1+
47	VCC_RTC	VCC_RTC	ESPI_EN#	RSVD
48	RSVD9	RSVD9	USB0_HOST_PRSNT	USB0_HOST_PRSNT
49	GBE0_SDP	GBE0_SDP	SYS_RESET#	SYS_RESET#
50	LPC_SERIRQ/ESPI_CS1#	LPC_SERIRQ	CB_RESET#	CB_RESET#
51	GND(FIXED)	GND (FIXED)	GND(FIXED)	GND (FIXED)
52	RSVD	RSVD	RSVD9	RSVD
53	RSVD	RSVD	RSVD9	RSVD
54	GPI0	GPI0/SD_D0	GPO1	GPO1/SD_CMD
55	RSVD	RSVD	RSVD9	RSVD

Table 10 PCOM-BA01VG Pin-out 3-6

Pin	Row A		Row B	
	PICMG Define	PCOM-BA01	PICMG Define	PCOM-BA01
56	RSVD	RSVD	RSVD9	RSVD
57	GND	GND	GPO2	GPO2/SD_WP
58	PCIE_TX3+	PCIE_TX3+	PCIE_RX3+	PCIE_RX3+
59	PCIE_TX3-	PCIE_TX3-	PCIE_RX3-	PCIE_RX3-
60	GND(FIXED)	GND (FIXED)	GND(FIXED)	GND (FIXED)
61	PCIE_TX2+	PCIE_TX2+	PCIE_RX2+	PCIE_RX2+
62	PCIE_TX2-	PCIE_TX2-	PCIE_RX2-	PCIE_RX2-
63	GPI1	GPI1/SD_D1	GPO3	GPO3/SD_CD
64	PCIE_TX1+	PCIE_TX1+	PCIE_RX1+	PCIE_RX1+
65	PCIE_TX1-	PCIE_TX1-	PCIE_RX1-	PCIE_RX1-
66	GND	GND	WAKE0#	WAKE0#
67	GPI2	GPI2/SD_D2	WAKE1#	WAKE1#
68	PCIE_TX0+	PCIE_TX0+	PCIE_RX0+	PCIE_RX0+
69	PCIE_TX0-	PCIE_TX0-	PCIE_RX0-	PCIE_RX0-
70	GND(FIXED)	GND (FIXED)	GND(FIXED)	GND (FIXED)
71	LVDS_A0+	LVDS_A0+	DDI0_PAIR0+	DDI0_PAIR0+
72	LVDS_A0-	LVDS_A0-	DDI0_PAIR0-	DDI0_PAIR0-
73	LVDS_A1+	LVDS_A1+	DDI0_PAIR1+	DDI0_PAIR1+
74	LVDS_A1-	LVDS_A1-	DDI0_PAIR1-	DDI0_PAIR1-
75	LVDS_A2+	LVDS_A2+	DDI0_PAIR2+	DDI0_PAIR2+

Table 11 PCOM-BA01VG Pin-out 4-6

Pin	Row A		Row B	
	PICMG Define	PCOM-BA01	PICMG Define	PCOM-BA01
76	LVDS_A2-	LVDS_A2-	DDI0_PAIR2-	DDI0_PAIR2-
77	LVDS_VDD_EN	LVDS_VDD_EN	DDI0_PAIR4+	RSVD
78	LVDS_A3+	LVDS_A3+	DDI0_PAIR4-	RSVD
79	LVDS_A3-	LVDS_A3-	LVDS_BKLT_EN	LVDS0_BACKLIGHT_EN / EDP_BKLTEN_3P3
80	GND(FIXED)	GND (FIXED)	GND(FIXED)	GND (FIXED)
81	LVDS_A_CK+	LVDS_A_CK+	DDI0_PAIR3+	DDI0_PAIR3+
82	LVDS_A_CK-	LVDS_A_CK-	DDI0_PAIR3-	DDI0_PAIR3-
83	LVDS_I2C_CK	LVDS_I2C_CK	LVDS_BKLT_CTRL	LVDS_BKLT_CTRL
84	LVDS_I2C_DAT	LVDS_I2C_DAT	VCC_5V_SBY	5VSB
85	GPI3	GPI3/ SD_D3	VCC_5V_SBY	5VSB
86	RSVD	RSVD	VCC_5V_SBY	5VSB
87	eDP_HPD	eDP_HPD	VCC_5V_SBY	5VSB
88	PCIE_CLK_REF+	PCIE_CLK_REF+	BIOS_DIS1#	BIOS_DIS1#
89	PCIE_CLK_REF-	PCIE_CLK_REF-	DDI0_HPD	DDI0_HPD
90	GND(FIXED)	GND (FIXED)	GND(FIXED)	GND (FIXED)
91	SPI_POWER	SPI_POWER	DDI0_PAIR5+	RSVD
92	SPI_MISO	SPI_MISO	DDI0_PAIR5-	RSVD
93	GPO0	GPO0/SD_CLK	DDI0_PAIR6+	RSVD
94	SPI_CLK	SPI_CLK	DDI0_PAIR6-	RSVD
95	SPI_MOSI	SPI_MOSI	DDI0_DDC_AUX_SEL	DDI0_DDC_AUX_SEL

Table 12 PCOM-BA01VG Pin-out 5-4

Pin	Row A		Row B	
	PICMG Define	PCOM-BA01	PICMG Define	PCOM-BA01
96	TPM_PP	TPM_PP	USB7_HOST_PRSNT	RSVD
97	TYPE10#	TYPE10#	SPI_CS#	SPI_CS#
98	SER0_TX	SER0_TX	DDI0_CTRLCLK_AUX+	DDI0_CTRLCLK_AUX+
99	SER0_RX	SER0_RX	DDI0_CTRLDATA_AUX-	DDI0_CTRLDATA_AUX-
100	GND(FIXED)	GND (FIXED)	GND(FIXED)	GND (FIXED)
101	SER1_TX	SER1_TX	FAN_PWMOUT	FAN_PWMOUT
102	SER1_RX	SER1_RX	FAN_TACHIN	FAN_TACHIN
103	LID#	LID#	SLEEP#	SLEEP#
104	VCC_12V	VCC_12V	VCC_12V	VCC_12V
105	VCC_12V	VCC_12V	VCC_12V	VCC_12V
106	VCC_12V	VCC_12V	VCC_12V	VCC_12V
107	VCC_12V	VCC_12V	VCC_12V	VCC_12V
108	VCC_12V	VCC_12V	VCC_12V	VCC_12V
109	VCC_12V	VCC_12V	VCC_12V	VCC_12V
110	GND(FIXED)	GND (FIXED)	GND(FIXED)	GND (FIXED)

Table 13 PCOM-BA01VG Pin-out 6-6

6 PORTWELL Software Tool

PORTWELL Evaluation Tool (PET)

The PORTWELL Evaluation Tool (PET) is an API which PORTWELL's customers can access the GPIO, I2C, SMBus, etc under Windows and Linux OS. For more information please contact PORTWELL.

7 Industry Specifications

The list below provides links to industry specifications that apply to PORTWELL COM Express Modules.

Low Pin Count Interface Specification, Revision 1.0 (LPC) http://www.intel.com/design/chipsets/industry/lpc.htm
Universal Serial Bus (USB) Specification, Revision 2.0 http://www.usb.org/home
PCI Specification, Revision 2.3 https://www.pcisig.com/specifications
Serial ATA Specification, Revision 3.0 http://www.serialata.org/
PICMG® COM Express Module™ Base Specification http://www.picmg.org/
PCI Express Base Specification, Revision 2.0 https://www.pcisig.com/specifications