

ROM-7421 Evaluation Board Quick Start Guide

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2. Introduction

This document is to introduce ROM-7421 evaluation boards and let the end users start module evaluation easily and smoothly. It includes 2 parts of concepts: Start-up process and the detail input/output connector and pin header specifications.

ROM-7421 evaluation boards are ROM-7421 RISC Qseven 2.0 module based on NXP i.MX6 Dual/Quad Plus 1GHz SoC and its corresponding carrier board ROM-DB7501 Advantech RISC Qseven 2.0 Evaluation Carrier Board. It is highly recommended to completely read this document before starting ROM-7421 board evaluation since it includes critical information as pin define, handling process and connector information. In the meanwhile, you should also comply with all warning notices and regulations you read in this document, it can prevent damaging ROM-7421 evaluation boards and spoiling those devices being connected.

Inappropriate installation may cause physical damage to ROM-7421 and its carrier board ROM-DB7501, result in function loss or abnormal behaviors as kernel panic or unstable electric currents in the evaluation kit. In this case, we would identify this inappropriate use of evaluation kit as human negligence and it is excluded from our quality assurance policy.

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3. Quick installation of ROM-7421 evaluation kit

3.1 Evaluation Boards Specification

Item	Description
Kernel	
CPU	Freescale i.MX6 Dual/Quad Plus 1GHz (ARM Cortex-A9)
2D/3D Accelerators	Support OpenGL ES 2.0 and OpenVG™ 1.1 hardware accelerators
System RAM	1GB/2GB
Onboard Flash	4GB
RTC	Yes
Watchdog Timer	Yes
Reset	H/W reset & S/W reset
I/O	
COM	-Console, RS-232, 2–wire(TX/RX), Reserved -COM 1, RS-232, 4–wire(TX/RX/RTS/CTS), Connector -COM 2, RS-232, 4–wire(TX/RX/RTS/CTS), DB9
Ethernet LAN	1 x 10/100/1000 Gigabit Ethernet(RJ-45)
USB Port	2 x USB 2.0 Type A, 1x USB 2.0 Pin Header (2 USB 2.0)
USB OTG	1 x USB 2.0 OTG
SD/MMC	1 x SD/MMC card slot
PCI-E	1 x PCIe Gen2 LAN1
SATA	1 x
I ² C Interface	1 x
I ² S Interface	1 for audio codec adapter board
SPI Interface	1 x
CAN BUS	1 x 5V level
GPIO	8 x 3.3V level GPIOs
Battery	1 x
Multimedia	
Graphic Chip	CPU internal LCD controller
LCD Resolution	Default: 800 x 480 7" WVGA Optional: 320 x 240 ~ 1920 x 1080
LVDS	2 x
HDMI	1 x
VGA	1 x
Brightness/ Backlight Control	Yes
Audio	Line-out&Mic-in (with Codec adapter board support)
Camera	1 x MIPI CSI

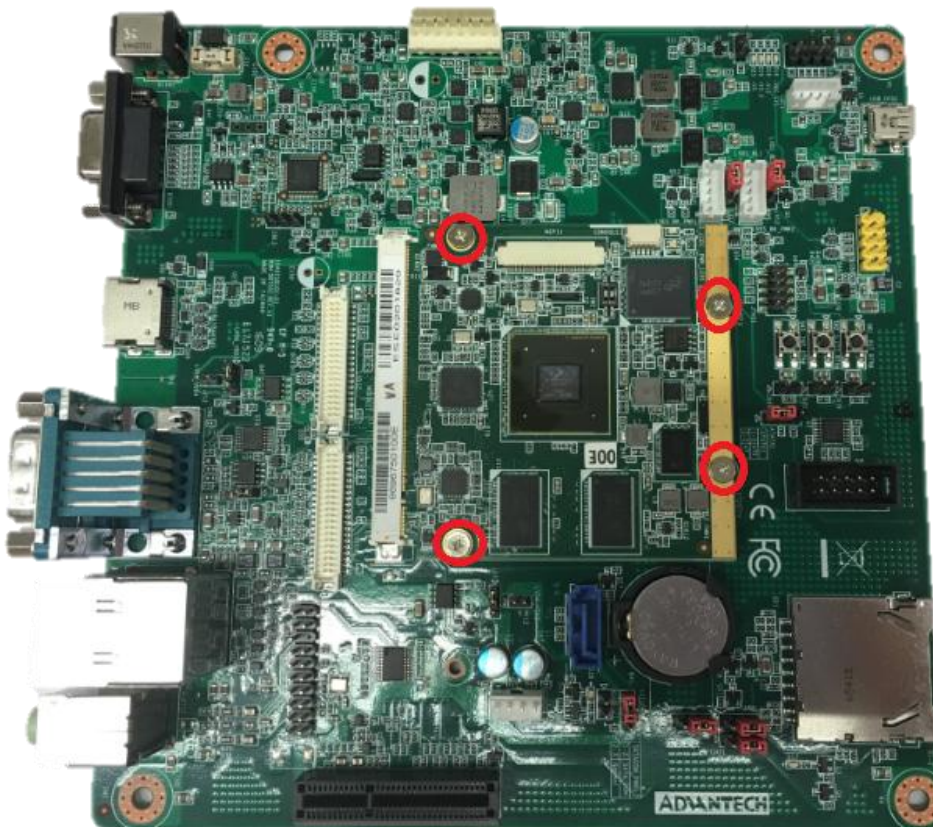
Power	
Power-on Type	AT/ATX
DC-input	12V
Power Consumption	Normal Run: 2.5W Full Run: 5W
Power Control	1 x Power button
	1 x Reset button
	1 x Sleep mode button
Power Management	-Standard mode -Sleep mode
Mechanical and Environmental	
Board size	ROM-7420: 70x70x5mm (PCB thickness 1.2mm; 10 layers)
	ROM-DB7500: 170 x 170 x 30 mm (PCB thickness 1.2mm; 8 layer)
Weight	225g
Operation Temperature	-40 ~ 85° C (32 ~ 140° F)
Operating Humidity	5% ~ 95% Relative Humidity, non condensing
Vibration	3.5G, 1000 times
Others	
RoHS	Yes
Certification	CE/FCC Class B
O.S	Yocto Linux

3.2 Proper Handling Method

- ① Please insert ROM-7421 module to carrier board ROM-DB7501 properly.



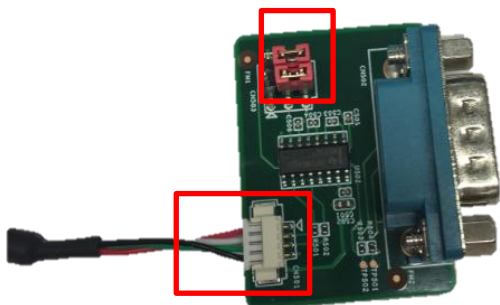
- ② Please fix the screws properly.



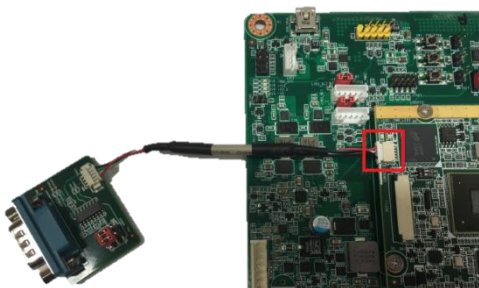
4. ROM-7421 quick start

4.1 Debug Port handling

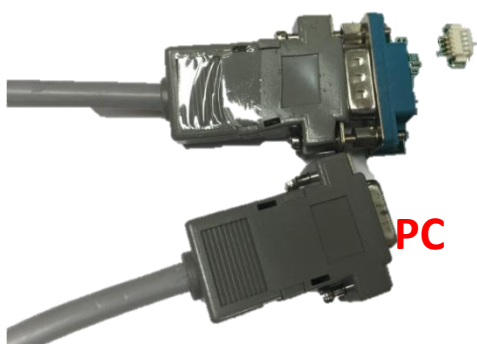
- ① Connect debug port cable to debug port adapter board, make sure the jumpers are set as below:



- ② Connect debug port to ROM-7421



- ③ Connect debug adapter board to a COM port cable then connect to PC

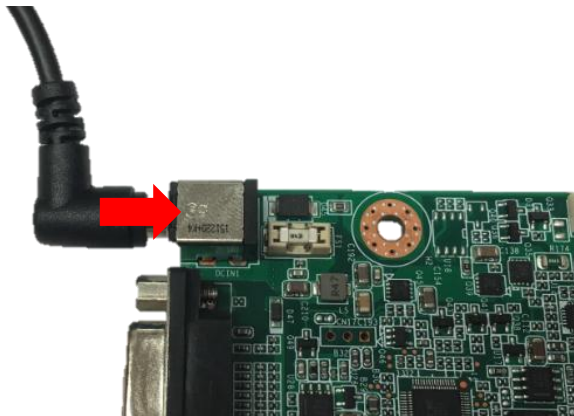


④ Set hyper terminal in your PC as below



4.2 Power on evaluation board

① Insert power adapter cable to DC-in jack, make sure it is a **+12V** power adapter



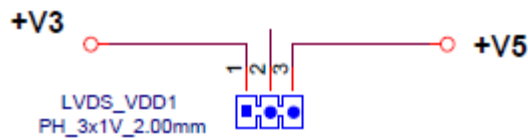
② Press the power button on ROM-DB7501



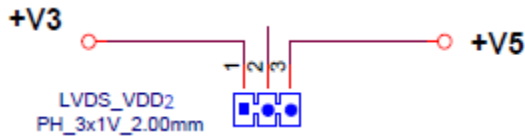
4.3 Jumper setting

① LVDS Jumper

LVDS_VDD1	Panel Power Setting
Description	Panel Power for LVDS1
(1-2)	3V
(2-3)	5V



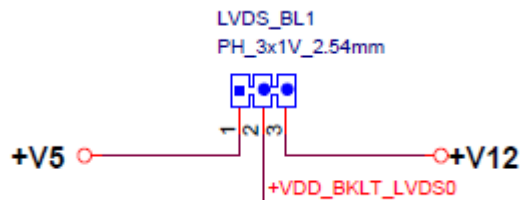
LVDS_VDD3	Panel Power Setting
Description	Panel Power for LVDS2
(1-2)	3V
(2-3)	5V



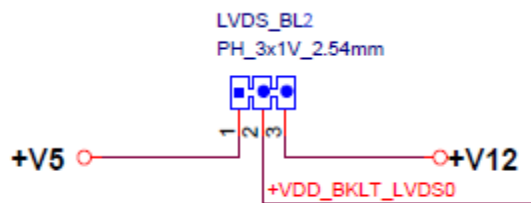
LVDS_VDD4	Panel Power Setting
Description	Panel Power for LVDS2
(1-2)	12V

② LVDS Backlight Inverter

LVDS_BL1	Panel Power Setting
Description	Panel Inverter for LVDS1
(1-2)	5V
(2-3)	12V



LVDS_BL2	Panel Power Setting
Description	Panel Inverter for LVDS1
(1-2)	5V
(2-3)	12V

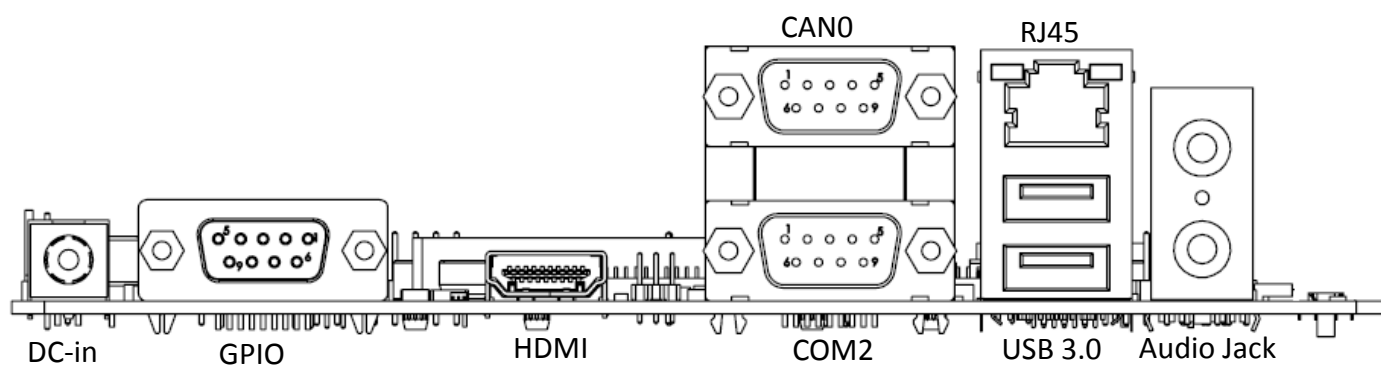


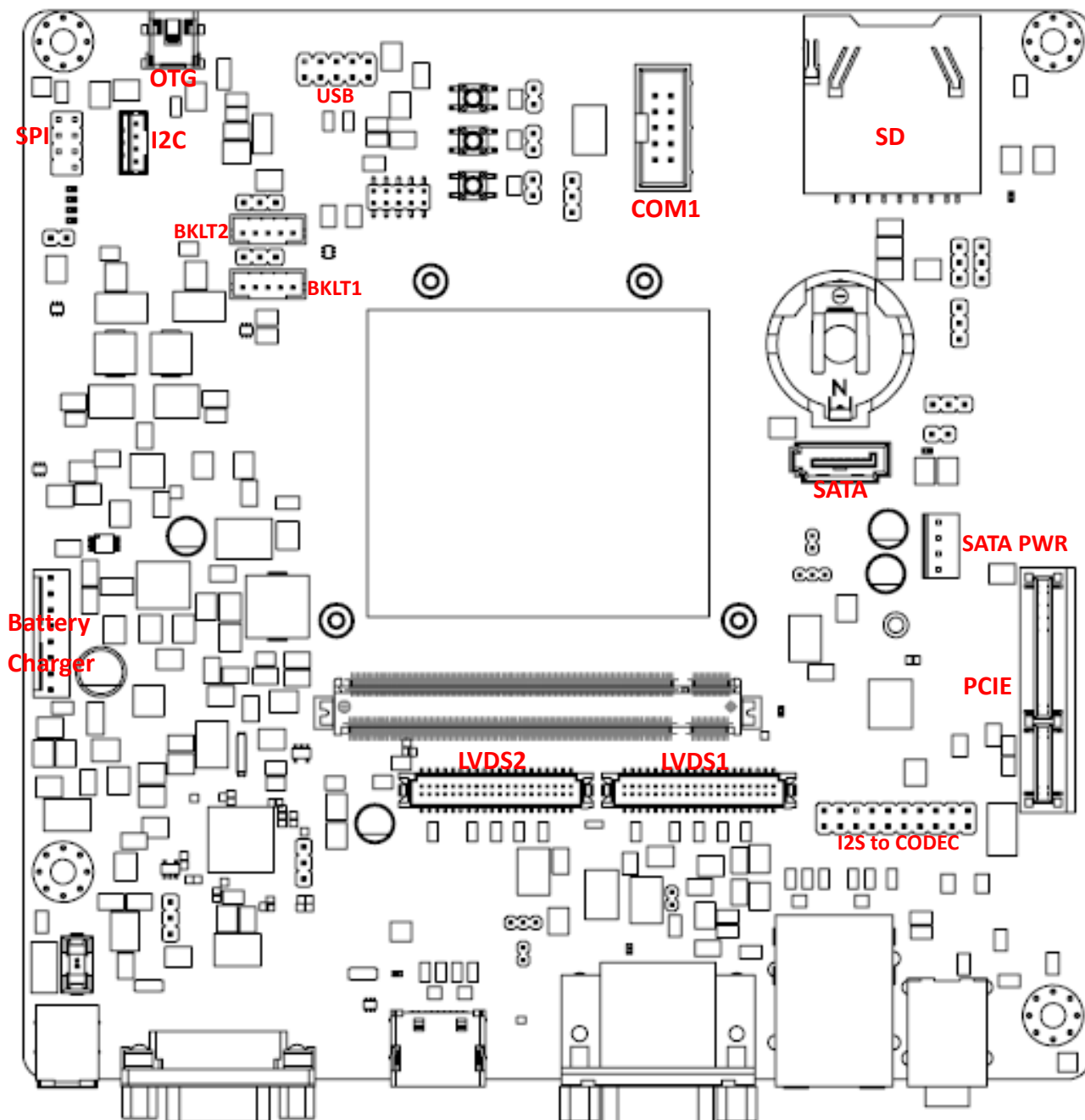
③ AT/ATX Jumper

ATATX1	Power Setting
Description	Power-on mode
(1-2)	ATX
(2-3)	AT

5. I/O Specification

5.1 ROM-7421 evaluation board overview



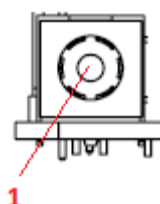


5.2 Connectors and Headers

A. DC Jack Connector

Please apply 12V power adapter through this connector.

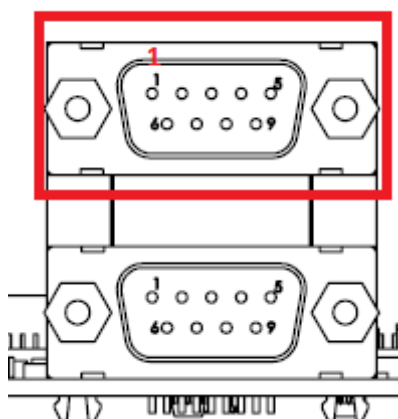
Pin	Signal
1	+12V
Shield	GND



B. CAN Bus

CAN buses with 5V level. The connector being used is standard DB9 in male.

Pin	Signal
1	
2	D-
3	
4	
5	GND
6	GND
7	D+
8	
9	



C. HDMI

ROM-DB7501 HDMI follow HDMI 2.0 Spec, supported resolution is up to 1920x1080

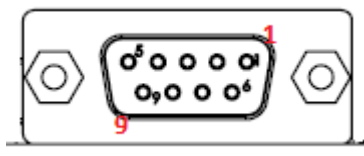
Pin	Signal
1	TMDS_LANE2+
2	GND
3	TMDS_LANE2-
4	TMDS_LANE1+
5	GND
6	TMDS_LANE1-
7	TMDS_LANE0+
8	GND
9	TMDS_LANE0-
10	TMDS_CLK+
11	GND
12	TMDS_CLK-
13	
14	
15	DDC CLK
16	DDC DAT
17	GND
18	+5V
19	HPD



D. GPIO

9 pins GPIO controlled by software

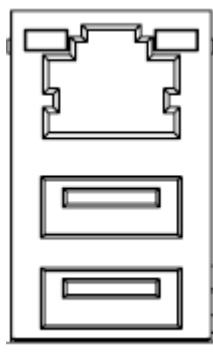
Pin	Signal
1	GPI_0
2	GPI_1
3	GPI_2
4	GPI_3
5	GND
6	GPO_0
7	GPO_1
8	GPO_2
9	GPO_3



E&F. RJ45 + USB connector

RJ45 with 10/100/1000 Ethernet plus two USB 2.0 Type A connectors

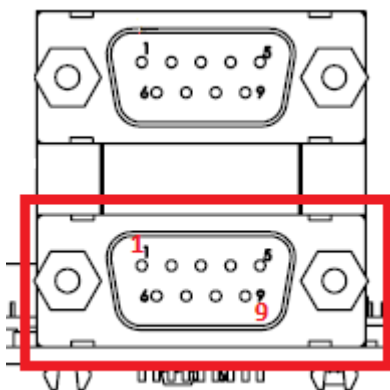
Pin	Signal
1	CT
2	MDI0+
3	MDI0-
4	MDI1+
5	MDI1-
6	MDI2+
7	MDI2-
8	MDI3+
9	MDI3-
10	GND
11	ACTIVE LED -
12	ACTIVE LED +
13	LINK 1000 -
14	LINK 100 -
15	+5V
16	USB PORT 2 -
17	USB PORT 2 +
18	GND
19	+5V
20	USB PORT 1 -
21	USB PORT 1 +
22	GND



G. COM2

9 pins DB9 for 4-wire RS-232

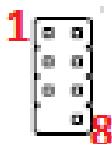
Pin	Signal
1	-
2	Rx
3	Tx
4	-
5	GND
6	-
7	RTS
8	CTS
9	-



H. SPI

SPI pin header

Pin	Signal
1	+3V
2	GND
3	SPI0_CS0#
4	SPI0_CLK
5	SPI0_MOSI
6	SPI0_MISO
7	-
8	SPI0_CS1#



I. I2C

I2C Connector

Pin	Signal
1	GND
2	I2C_DATA
3	I2C_CLK
4	+3V



J. I2S

I2S to audio codec board (Referenced P/N: 9696MEG510E)

Pin	Signal
1	AUDIO_VDDA
2	GND
3	AUDIO_VDDA
4	I2S_SDIN

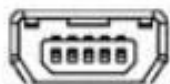


5	I2S_SDOUT
6	I2S_LRCK
7	I2S_CLK
8	AUDIO_MCK
9	-
10	GND
11	I2C_AUDIO_CLK
12	MIC_BIAS
13	I2C_AUDIO_DATA
14	GND
15	-
16	HP_R
17	MIC_IN
18	GND
19	GND
20	HP_L

K. OTG

USB OTG Port for ROM-DB7501

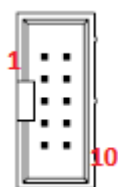
Pin	Signal
1	+5V
2	USB_OTG D-
3	USB_OTG D+
4	OTG ID
5	GND



L. COM1

4-wire RS-232

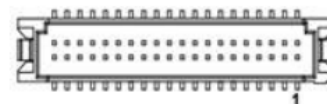
Pin	Signal
1	-
2	-
3	RX
4	RTS
5	TX
6	CTS
7	-
8	-
9	GND
10	-



M. LVDS 1 & 2

LVDS1 and LVDS2 Pin Define

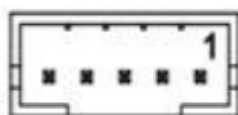
Pin	Signal	Pin	Signal
1	+VDD_LVDS	2	+VDD_LVDS
3	GND	4	GND
5	+VDD_LVDS	6	+VDD_LVDS
7	LVDS D0-	8	-
9	LVDS D0+	10	-
11	GND	12	GND
13	LVDS D1-	14	-
15	LVDS D1+	16	-
17	GND	18	GND
19	LVDS D2-	20	-
21	LVDS D2+	22	-
23	GND	24	GND
25	LVDS CK-	26	-
27	LVDS CK+	28	-
29	GND	30	GND
31	DID_CK	32	DID_DAT
33	GND	34	GND
35	LVDS D3-	36	-
37	LVDS D3+	38	-
39	GND	40	LVDS_CTRL



N. BKLT 1&2

LVDS1 and LVDS2 Backlight

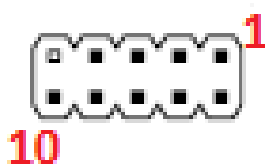
Pin	Signal
1	+VDD
2	GND
3	BKL_ENABLE
4	Brightness
5	+5V



O. USB

USB Pin header for ROM-DB7501

Pin	Signal
1	+5V
2	+5V
3	USB0_DN_X
4	USB3_DN_X



5	USB0_DP_X
6	USB3_DP_X
7	GND
8	GND
10	GND

P. Battery Charger

Smart Battery for ROM-DB7501

Pin	Signal
1	GND
2	GND
3	BAT_THER
4	BAT_ID_CN
5	I2C_DAT_BAT
6	I2C_CK_BAT
7	+VBATT
8	+VBATT



Q. SATA

SATA /SATA DOM support

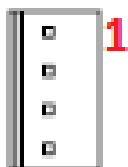
Pin	Signal
1	GND
2	SATA_TX+
3	SATA_TX-
4	GND
5	SATA_RX-
6	SATA_RX+
7	SATA DOM Pin 7



R. SATA Power

SATA/SATA DOM Power

Pin	Signal
1	+5V
2	GND
3	GND
4	+12V



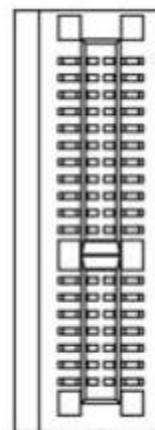
S. PCIe

PCIe to mini-PCIe adapter card reference P/N is 9680015491

Pin	Signal	Pin	Signal
B1	+12V	A1	+12V
B2	+12V	A2	+12V
B3	+12V	A3	+12V
B4	GND	A4	GND
B5	PCIE_A_CK	A5	PCIEX_A_JTAG2
B6	PCIE_A_DAT	A6	PCIEX_A_JTAG3
B7	GND	A7	PCIEX_A_JTAG4
B8	+3V	A8	PCIEX_A_JTAG5
B9	PCIEX_A_JTAG1	A9	+3V
B10	+3V	A10	+3V
B11	+3V	A11	PWRGD

Mechanical Key

B12	Reserved	A12	GND
B13	GND	A13	PCIE_A_REFCK+
B14	PCIE_A_X_TX+	A14	PCIE_A_REFCK-
B15	PCIE_A_X_TX-	A15	GND
B16	GND	A16	PCIE_A_X_RX-
B17	+3V	A17	PCIE_A_X_RX-
B18	GND	A18	GND



6. Test Scripts

①GPIO

```
# cat /sys/kernel/debug/gpio
# for N in 0 1 2 3; do echo $N > /sys/class/gpio/export 2>/dev/null; done
# for N in 0 1; do echo out>/sys/class/gpio/gpio${N}/direction; done
# for N in 2 3; do echo in > /sys/class/gpio/gpio${N}/direction; done
# grep "" /sys/class/gpio/gpio{0..3}/direction
# cat /sys/kernel/debug/gpio
```

```
root@quark:~# cat /sys/kernel/debug/gpio
GPIOs 0-7, platform/sch_gpio.2398, sch_gpio.2398:
 gpio-0   (sysfs           ) out hi
 gpio-1   (sysfs           ) out lo
 gpio-2   (sysfs           ) in  lo
 gpio-3   (sysfs           ) in  hi

GPIOs 8-15, intel_qrk_gip_gpio:
 gpio-8   (SPI_CS          ) out hi
root@quark:~# for N in 0 1 2 3; do echo $N > /sys/class/gpio/export 2>/dev/null; done
root@quark:~# for N in 0 1; do echo out>/sys/class/gpio/gpio${N}/direction; done
root@quark:~# for N in 2 3; do echo in > /sys/class/gpio/gpio${N}/direction; done
root@quark:~# grep "" /sys/class/gpio/gpio{0..3}/direction
/sys/class/gpio/gpio0/direction:out
/sys/class/gpio/gpio1/direction:out
/sys/class/gpio/gpio2/direction:in
/sys/class/gpio/gpio3/direction:in
root@quark:~# cat /sys/kernel/debug/gpio
GPIOs 0-7, platform/sch_gpio.2398, sch_gpio.2398:
 gpio-0   (sysfs           ) out lo
 gpio-1   (sysfs           ) out lo
 gpio-2   (sysfs           ) in  lo
 gpio-3   (sysfs           ) in  lo

GPIOs 8-15, intel_qrk_gip_gpio:
 gpio-8   (SPI_CS          ) out hi
```

- Connect Pin 0 with Pin3

```
cd /sys/class/gpio; \
echo 0 > gpio0/value; grep "" gpio{0,3}/value; \
echo 1 > gpio0/value; grep "" gpio{0,3}/value; cd -
```

```
root@quark:~# cd /sys/class/gpio; \
> echo 0 > gpio0/value; grep "" gpio{0,3}/value; \
> echo 1 > gpio0/value; grep "" gpio{0,3}/value; cd -
gpio0/value:0
gpio3/value:0
gpio0/value:1
gpio3/value:1
```

- Connect Pin 1 with Pin 2

```
cd /sys/class/gpio; \
```

```
echo 0 > gpio1/value; grep "" gpio{1,2}/value; \  
echo 1 > gpio1/value; grep "" gpio{1,2}/value; cd -
```

```
root@quark:~# cd /sys/class/gpio; \  
> echo 0 > gpio1/value; grep "" gpio{1,2}/value; \  
> echo 1 > gpio1/value; grep "" gpio{1,2}/value; cd -  
gpio1/value:0  
gpio2/value:0  
gpio1/value:1  
gpio2/value:1  
/home/root
```

② RS-232 Loop back

```
# stty -F /dev/ttyS0 -echo; cat /dev/ttyS0 &  
# echo "1234567890" > /dev/ttyS0; killall cat
```

```
1016_1103 $ stty -F /dev/ttyS0 -echo; cat /dev/ttyS0 &  
[1] 295  
1016_1103 $ echo "1234567890" > /dev/ttyS0; killall cat  
1234567890  
  
[1]+ Terminated cat /dev/ttyS0
```

③ WiFi (Test with EWM-W142H01E)

```
# SSID={ssid here}  
# PSWD= {password here}  
# wifi_connect.sh "${SSID}" "${PSWD}"  
# DEV=wlan0  
# SVC=$(P=`connmanctl services | grep "$SSID"` && echo -n wifi_{$P#wifi_})  
# set - `connmanctl services $SVC | grep "Nameservers ="`  
# DNS=${4/,/}  
# ping -c5 $DNS -I $DEV
```

```

root@quark:~# SSID="ESSD Testing"
root@quark:~# PSWD=adv27927818
root@quark:~# wifi_connect.sh "${SSID}" "${PSWD}"
** space char detected **
Scanning WiFi...done
Checking available service...found
[ 52.747137] wlan0: authenticate with 78:44:76:d8:11:a8
[ 52.767891] wlan0: send auth to 78:44:76:d8:11:a8 (try 1/3)
[ 52.780522] wlan0: authenticated
[ 52.791289] wlan0: associate with 78:44:76:d8:11:a8 (try 1/3)
[ 52.807852] wlan0: RX AssocResp from 78:44:76:d8:11:a8 (capab=0xc11 status=0 aid=4)
[ 52.824917] wlan0: associated
[ 52.828233] IPv6: ADDRCONF(NETDEV_CHANGE): wlan0: link becomes ready

Connected wifi_0cd29257bc19_455353442054657374696e67_managed_psk
root@quark:~#
root@quark:~# DEV=wlan0
root@quark:~# SVC=$(P=`connmanctl services | grep "$SSID"`` && echo -n wifi_{$P#wifi_})
root@quark:~# set - `connmanctl services $SVC | grep "Nameservers ="`
root@quark:~# DNS=${4/,/}
root@quark:~# ping -c5 $DNS -I $DEV
PING 168.95.1.1 (168.95.1.1): 56 data bytes
64 bytes from 168.95.1.1: seq=0 ttl=246 time=29.138 ms
64 bytes from 168.95.1.1: seq=1 ttl=246 time=25.114 ms
64 bytes from 168.95.1.1: seq=2 ttl=246 time=32.899 ms
64 bytes from 168.95.1.1: seq=3 ttl=246 time=67.309 ms
64 bytes from 168.95.1.1: seq=4 ttl=246 time=7.968 ms

--- 168.95.1.1 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max = 7.968/32.485/67.309 ms

```

④ LAN

```

# DEV=eth0 # or eth1
# MAC=$(set - `ifconfig $DEV | grep HWaddr`; echo ${5~~} | sed "s/://g")
# set - $(connmanctl services | grep $MAC)
# SVC=$3
# set - `connmanctl services $SVC | grep "Nameservers ="`
# DNS=${4/,/}
# ping -c5 $DNS -I $DEV

```

```

root@quark:~# DEV=eth0 # or eth1
root@quark:~# MAC=$(set - `ifconfig $DEV | grep HWaddr`; echo ${5~~} | sed "s/://g")
root@quark:~# set - $(connmanctl services | grep $MAC)
root@quark:~# SVC=$3
root@quark:~# set - `connmanctl services $SVC | grep "Nameservers ="`
root@quark:~# DNS=${4/,/}
root@quark:~# ping -c5 $DNS -I $DEV
PING 172.22.2.100 (172.22.2.100): 56 data bytes
64 bytes from 172.22.2.100: seq=0 ttl=127 time=400.794 ms
64 bytes from 172.22.2.100: seq=1 ttl=127 time=1159.124 ms
64 bytes from 172.22.2.100: seq=2 ttl=127 time=159.002 ms
64 bytes from 172.22.2.100: seq=3 ttl=127 time=801.840 ms
64 bytes from 172.22.2.100: seq=4 ttl=127 time=1500.059 ms

--- 172.22.2.100 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max = 159.002/804.163/1500.059 ms

```

⑤USB

```
# dd if=/dev/urandom of=/PTN bs=1024 count=1
# dd if=/PTN of=/dev/sda bs=1024 count=1 seek=4
# dd if=/dev/sda of=/READ bs=1024 count=1 skip=4
# diff /READ /PTN && echo "correct" || echo "incorrect"
```

```
root@quark:~# dd if=/dev/urandom of=/PTN bs=1024 count=1
1+0 records in
1+0 records out
root@quark:~# dd if=/PTN of=/dev/sda bs=1024 count=1 seek=4
[ 3937.003122] sd 1:0:0:0: [sda] No Caching mode page found
[ 3937.008568] sd 1:0:0:0: [sda] Assuming drive cache: write through
[ 3937.023594] sda: sda1
1+0 records in
1+0 records out
root@quark:~# dd if=/dev/sda of=/READ bs=1024 count=1 skip=4
1+0 records in
1+0 records out
root@quark:~# diff /READ /PTN && echo "correct" || echo "incorrect"
correct
```

⑥3G (Test with EWM-C106FT01E)

```
# ll /dev/ttyU*
```

```
root@quark:/tools# ll /dev/ttyUSB*
crw-rw----  1 root   dialout  188,  0 Jan 26 05:40 /dev/ttyUSB0
crw-rw----  1 root   dialout  188,  1 Jan 26 05:40 /dev/ttyUSB1
crw-rw----  1 root   dialout  188,  2 Jan 26 05:40 /dev/ttyUSB2
```

```
# ifconfig eth0 down; ifconfig eth1 down
# pppd connect 'chat -v -s -t 10 "" "AT" "" "ATDT*99#" "CONNECT" "" \
user username password password /dev/ttyUSB2 460800 nodetach crtscts \
debug usepeerdns defaultroute &
# ifconfig
```

```
sent [IPCP ConfReq id=0x24 <addr 111.70.126.19> <ms-dns1 168.95.1.1> <ms-dns2 168.95.192.1>]
rcvd [IPCP ConfAck id=0x24 <addr 111.70.126.19> <ms-dns1 168.95.1.1> <ms-dns2 168.95.192.1>]
Could not determine remote IP address: defaulting to 10.64.64.64
local IP address 111.70.126.19
remote IP address 10.64.64.64
primary DNS address 168.95.1.1
secondary DNS address 168.95.192.1
Script /etc/ppp/ip-up started (pid 327)
Script /etc/ppp/ip-up finished (pid 327), status = 0x0

root@quark:/tools# ifconfig
lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:168 errors:0 dropped:0 overruns:0 frame:0
          TX packets:168 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:12856 (12.5 KiB)  TX bytes:12856 (12.5 KiB)

ppp0      Link encap:Point-to-Point Protocol
          inet addr:111.70.126.19  P-t-P:10.64.64.64  Mask:255.255.255.255
          UP POINTOPOINT RUNNING NOARP MULTICAST  MTU:1500  Metric:1
          RX packets:39 errors:0 dropped:0 overruns:0 frame:0
          TX packets:42 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:3
          RX bytes:1074 (1.0 KiB)  TX bytes:2055 (2.0 KiB)
```

```
# cat /etc/resolv.conf
```

```
# ping -c5 8.8.8.8
```

```
root@quark:~# cat /etc/resolv.conf
# This file is managed by systemd-resolved(8). Do not edit.
#
# Third party programs must not access this file directly, but
# only through the symlink at /etc/resolv.conf. To manage
# resolv.conf(5) in a different way, replace the symlink by a
# static file or a different symlink.

nameserver 8.8.8.8
nameserver 8.8.4.4
nameserver 2001:4860:4860::8888
# Too many DNS servers configured, the following entries may be ignored.
nameserver 2001:4860:4860::8844
root@quark:~# ping -c5 8.8.8.8
PING 8.8.8.8 (8.8.8.8): 56 data bytes
64 bytes from 8.8.8.8: seq=0 ttl=47 time=1678.253 ms
64 bytes from 8.8.8.8: seq=1 ttl=47 time=997.772 ms
64 bytes from 8.8.8.8: seq=2 ttl=47 time=457.302 ms
64 bytes from 8.8.8.8: seq=3 ttl=47 time=386.656 ms
64 bytes from 8.8.8.8: seq=4 ttl=47 time=376.381 ms

--- 8.8.8.8 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max = 376.381/779.272/1678.253 ms
```