



Ethernet Extension Card for EVB Application Note

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APPLICABILITY TABLE

PRODUCTS

-   LE920 AUTO SERIES
-   LE910 CAT.1 SERIES
-   LE940 AUTO SERIES
-   TELIT EVB

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1. INTRODUCTION

1.1. Scope

Scope of this document is to provide a short guidance on how to configure and operate the Ethernet Extension board when connected to Telit EVB.

1.2. Audience

This document is intended for developers using Telit EVB platform with the Ethernet Extension board.

1.3. Contact Information, Support

For general contact, technical support services, technical questions and report documentation errors contact Telit Technical Support at:

- TS-EMEA@telit.com
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Our aim is to make this guide as helpful as possible. Keep us informed of your comments and suggestions for improvements.

Telit appreciates feedback from the users of our information.

1.4. Text Conventions



Danger – This information **MUST** be followed or catastrophic equipment failure or bodily injury may occur.



Caution or Warning – Alerts the user to important points about integrating the module, if these points are not followed, the module and end user equipment may fail or malfunction.



Tip or Information – Provides advice and suggestions that may be useful when integrating the module.

All dates are in ISO 8601 format, i.e. YYYY-MM-DD.

1.5. Related Documents

- [Telit EVB User Guide, 1VV0301249](#)

2. WIRED ETHERNET CONNECTION

2.1. Extension Card Description

The Ethernet extension card provides the option to use the SGMII, RGMII or PCIe interfaces of the Modem and SDK to a wired 10/100/1Gbps wired ethernet connection.

The interface used for the Ethernet phy depends on the Modem capability.

The card includes the following main components:

1. An Atheros (Qualcomm) AR8151-B PCIe to 10/100/1000 Mbps Ethernet Transceiver.
2. An Automotive grade Marvel 88EA1512 Integrated 10/100/1000 Mbps Ethernet Transceiver.
3. An SFP slot for SGMII external ethernet transceivers.

The interface selection to be used (SGMII, RGMII or PCIe) is according to the functionality of the modem available interfaces.

For example:

- The SGMII interface is only available when using the LE920A4 or similar modules is used
- The PCIe interface is only available when using LE940A6/A9 series modules.

2.3. Ethernet Extension Card

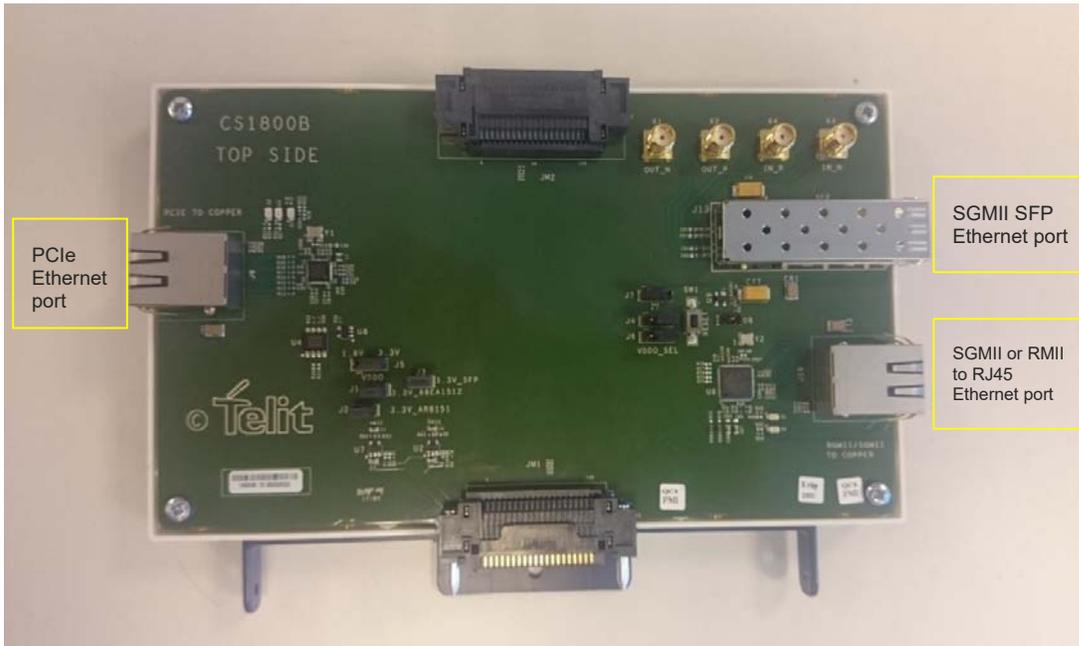


Figure 2-2 Ethernet Extension Card

2.4. Extension Card Connection to EVB

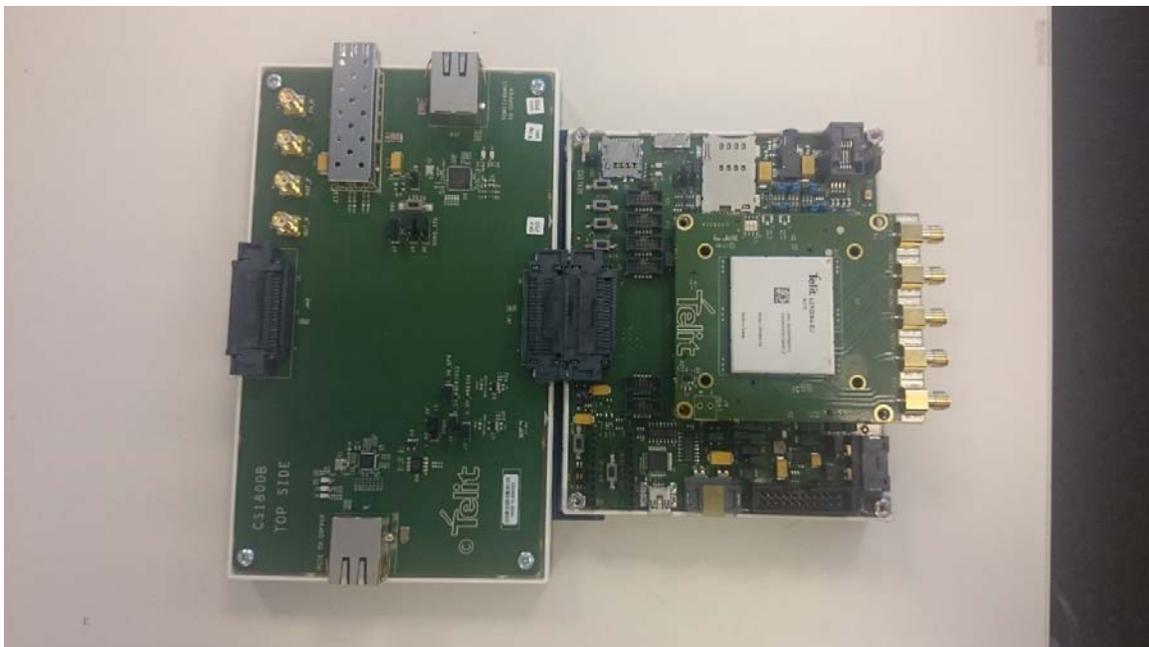


Figure 2-3 Extension Connection to EVB

2.5. Connection and Configuration

2.5.1. SGMII to Ethernet (using Marvell 88AE1512)

Insert a data SIM card to the proper EVB SIM slot.

Connect one end of an ethernet cable to the board RJ45 connector, to the port marked as “SGMII/RGMII to Copper”. The other end of the cable should connect to the device you want to provide the internet connection.

Launch the serial port console connection to the modem.

Login to the Console serial interface.

Type in the console prompt to run the following script and command:

```
"/etc/init.d/start_emac_le start"
```

Here is an example of the console log output:

```
~ #/etc/init.d/start_emac_le start
[ 59.919608] emac start
[ 60.095256] libphy: emac-mdio: probed
[ 60.300883] arp_ignore is set
[ 60.456426] qcom-emac 7c40000.qcom,emac eth0: TX queues 1, TX descriptors 512
[ 60.462535] qcom-emac 7c40000.qcom,emac eth0: RX queues 1, Rx descriptors 256
[ 60.674673] IPv6: ADDRCONF(NETDEV_UP): eth0: link is not ready
done
~ # [ 61.030359] USB QCMAP NL IOCTL Snd GETNEIGH Succ
[ 61.325290] USB QCMAP NL IOCTL Snd GETNEIGH Succ
[ 63.976618] qcom-emac 7c40000.qcom,emac eth0: Link is Up - 1Gbps/Full - flow control rx/tx
[ 63.983969] IPv6: ADDRCONF(NETDEV_CHANGE): eth0: link becomes ready
[ 64.329999] QTI:Processing LINK_UP
[ 64.338927] QTI:ETH mode
[ 64.348761] QTI:Enable mobileap
[ 64.359008] QTI:LINK_UP message posted
[ 64.368956] QCMAP:Enable mobileap
[ 64.719114] QCMAP:Enable mobileap done
[ 64.730082] QTI:Setup TETHERED link
[ 64.897145] device eth0 entered promiscuous mode
[ 64.924247] bridge0: port 1(eth0) entered forwarding state
[ 64.928817] bridge0: port 1(eth0) entered forwarding state
[ 64.981444] QTI:LINK_UP Processed
[ 65.368882] ETHERNET Client Mac Address is 5c:ff:35:d:fd:ec
[ 70.568532] QCMAP:Ethernet Client IP Addr 192.168.225.35
[ 79.934075] bridge0: port 1(eth0) entered forwarding state

~ # ifconfig
bridge0 Link encap:Ethernet HWaddr 1E:C6:69:49:51:35
        inet addr:192.168.225.1 Bcast:192.168.225.255 Mask:255.255.255.0
        inet6 addr: fe80::1cc6:69ff:fe46:4e32/64 Scope:Link
        UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
        RX packets:153 errors:0 dropped:0 overruns:0 frame:0
        TX packets:92 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:0
        RX bytes:12981 (12.6 KiB) TX bytes:7282 (7.1 KiB)

eth0 Link encap:Ethernet HWaddr 00:80:48:BA:D1:30
        inet addr:169.254.4.1 Bcast:169.254.4.255 Mask:255.255.255.0
        inet6 addr: fe80::280:48ff:feba:d130/64 Scope:Link
        UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
        RX packets:208 errors:0 dropped:0 overruns:0 frame:0
```

```
TX packets:103 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RX bytes:20761 (20.2 KiB) TX bytes:9762 (9.5 KiB)
Interrupt:108
```

```
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:3 errors:0 dropped:0 overruns:0 frame:0
      TX packets:3 errors:0 dropped:0 overruns:0 carrier:0
      collisions:0 txqueuelen:0
      RX bytes:172 (172.0 B) TX bytes:172 (172.0 B)

rmnet0 Link encap:UNSPEC HWaddr 00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00
      UP RUNNING MTU:2000 Metric:1
      RX packets:0 errors:0 dropped:0 overruns:0 frame:0
      TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
      collisions:0 txqueuelen:1000
      RX bytes:0 (0.0 B) TX bytes:0 (0.0 B)
```

~ #

Next, type in the console prompt: "QCMAP_CLI". This will run a menu based tool to initialize the ethernet bridging configuration from the Cellular data connection to the device connected to the Ethernet cable.

Select option "30". Next, select option "32" to initialize the WAN connection.

Here is an example of the resulted run:

```

Command Prompt - adb shell
mcm9607 login: root
Password:
Last login: Thu Aug 31 14:00:40 UTC 2017 on ttyHSL0
~ # QCMAP_CLI

Please select an option to test from the items listed below.

1. Display Current Config          51. Get MDNS Status
2. Delete SNAT Entry              52. Get Station Mode Status
3. Add SNAT Entry                 53. Set DLNA Media Directory
4. Get SNAT Config                54. Get DLNA Media Directory
5. Set Roaming                    55. Set MobileAP/WLAN Bootup Config
6. Get Roaming                    56. Get MobileAP/WLAN Bootup Config
7. Delete DMZ IP                  57. Enable/Disable IPV4
8. Add DMZ IP                     58. Get IPV4 State
9. Get DMZ IP                     59. Get Data Bitrate
10. Set IPSEC VPN Passthrough     60. Set UPnP Notify Interval
11. Get IPSEC VPN Passthrough     61. Get UPnP Notify Interval
12. Set PPTP VPN Passthrough      62. Set DLNA Notify Interval
13. Get PPTP VPN Passthrough      63. Get DLNA Notify Interval
14. Set L2TP VPN Passthrough      64. Add DHCP Reservation Record
15. Get L2TP VPN Passthrough      65. Get DHCP Reservation Records
16. Set Autocconnect Config       66. Edit DHCP Reservation Record
17. Get Autocconnect Config       67. Delete DHCP Reservation Record
18. Get WAN status                68. Activate Hostapd Config
19. Add Firewall Entry            69. Activate Supplicant Config
20. Enable/Disable M-DNS           70. Get Webserver WWAN access flag
21. Enable/Disable UPnP           71. Set Webserver WWAN access flag
22. Enable/Disable DLNA           72. Enable/Disable ALG
23. Display Firewalls             73. Set SIP server info
24. Delete Firewall Entry         74. Get SIP server info
25. Get WWAN Statistics           75. Restore Factory Default Settings(** Will Reboot Device )
26. Reset WWAN Statistics         76. Get Connected Device info
27. Get Network Configuration    77. Get Cradle Mode
28. Get NAT Type                  78. Set Cradle Mode
29. Set NAT Type                  79. Get Prefix Delegation Config
30. Enable/Disable Mobile AP      80. Set Prefix Delegation Config
31. Enable/Disable WLAN           81. Get Prefix Delegation Status
32. Connect/Disconnect Backhaul   82. Set/Get Gateway URL
33. Get Mobile AP status          83. Enable/Disable DDNS
34. Set NAT Timeout              84. Set DDNS Config
35. Get NAT Timeout              85. Get DDNS Config
36. Set WLAN Config              86. Enable/Disable TinyProxy
37. Get WLAN Config              87. Get TinyProxy Status
38. Activate WLAN                 88. Set DLNAWhitelisting
39. Set LAN Config                89. Get DLNAWhitelisting
40. Get LAN Config                90. Add DLNAWhitelistingIP
41. Activate LAN                  91. Delete DLNAWhitelistingIP
42. Get WLAN Status              92. Set UPNPPinhole State
43. Enable/Disable IPV6           93. Get UPNPPinhole State
44. Set Firewall Config           94. Configure Active Backhaul Priority
45. Get Firewall Config           95. Get Backhaul Priority
46. Get IPV6 State                96. Set IP Passthrough Config
47. Get WWAN Profile              97. Get IP Passthrough Config
48. Set WWAN Profile              98. Get IP Passthrough State
49. Get UPnP Status               99. Add Ethernet module
50. Get DLNA Status               100. Teardown/Disable and Exit

Option >
Option > 30
Please input MobileAP State(1-Enable/0-Disable) : 1
MobileAP Enable succeeds.

Option > 32
Please input Backhaul State(1-Connect/0-Disconnect) : 1
Please input Call Type (1-IPV4; 2-IPV6) : 1
ConnectBackHaul succeeds.

```

Below is the result after QCMAP CLI connection:

```

~ # [ 449.083973] QCMAP:bringup v4
[ 450.116923] QCMAP:WAN connected v4

~ # ifconfig
bridge0 Link encap:Ethernet HWaddr 1E:C6:69:49:51:35
  inet addr:192.168.225.1 Bcast:192.168.225.255 Mask:255.255.255.0
  inet6 addr: fe80::1cc6:69ff:fe46:4e32/64 Scope:Link
  UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
  RX packets:766 errors:0 dropped:0 overruns:0 frame:0
  TX packets:584 errors:0 dropped:0 overruns:0 carrier:0
  collisions:0 txqueuelen:0
  RX bytes:53486 (52.2 KiB) TX bytes:41581 (40.6 KiB)

eth0 Link encap:Ethernet HWaddr 00:80:48:BA:D1:30
  inet addr:169.254.4.1 Bcast:169.254.4.255 Mask:255.255.255.0
  inet6 addr: fe80::280:48ff:feba:d130/64 Scope:Link
  UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
  RX packets:949 errors:0 dropped:0 overruns:0 frame:0
  TX packets:589 errors:0 dropped:0 overruns:0 carrier:0
  collisions:0 txqueuelen:1000
  RX bytes:81620 (79.7 KiB) TX bytes:50697 (49.5 KiB)
  Interrupt:108

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:3 errors:0 dropped:0 overruns:0 frame:0
  TX packets:3 errors:0 dropped:0 overruns:0 carrier:0
  collisions:0 txqueuelen:0
  RX bytes:172 (172.0 B) TX bytes:172 (172.0 B)

rmnet0 Link encap:UNSPEC HWaddr 00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00
  UP RUNNING MTU:2000 Metric:1
  RX packets:19 errors:0 dropped:0 overruns:0 frame:0
  TX packets:26 errors:0 dropped:0 overruns:0 carrier:0
  collisions:0 txqueuelen:1000
  RX bytes:2552 (2.4 KiB) TX bytes:2164 (2.1 KiB)

rmnet_data0 Link encap:UNSPEC HWaddr 00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00
  inet addr:10.134.103.234 Mask:255.255.255.252
  inet6 addr: fe80::bb80:2724:68c3:c489/64 Scope:Link
  UP RUNNING MTU:1500 Metric:1
  RX packets:19 errors:0 dropped:0 overruns:0 frame:0
  TX packets:26 errors:0 dropped:0 overruns:0 carrier:0
  collisions:0 txqueuelen:1000
  RX bytes:2367 (2.3 KiB) TX bytes:2164 (2.1 KiB)

```

It is visible from the output that the cellular data connection ip received is in *rmnet_data0*. The gateway IP for devices connecting to the Ethernet port is 192.168.225.1 and the bridge is configured to route between the cellular data connection and the connected devices on the Ethernet port.

Below is an example of the IP received by a PC connected to the port browsing the internet through the ethernet bridged cellular connection:

```
C:\Users\markge>ipconfig
Windows IP Configuration

Ethernet adapter Local Area Connection:

    Connection-specific DNS Suffix . . . : 
    Link-local IPv6 Address . . . . . : fe80::a0f4:374b:a993:9a2a%11
    IPv4 Address. . . . . : 192.168.225.35
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 192.168.225.1
```

2.5.2. PCIe to Ethernet (Using AR8151-B)

Initializing this interface connection should be similar as described in the previous paragraph.

2.6. Jumpers

The functions and default setting of the Jumpers on the board are described in the table below:

Jumper	Position	Description
J1	Short	The 3.3V power input for SGMII/RGMII PHY (88EA1512)
J2	Short	The 3.3V power input for PCIe ETH PHY (AR8151)
J3	Short	The 3.3V power input for SFP module (optional)
J4	2-3	SGMII/RGMII PHY CONFIG pin: PHYAD bit 0 and VDDO_LEVEL. Pins 1-2; '1'=2.5V Pins 2-3; '0'=3.3V
J5	2-3	SGMII/RGMII PHY VDDO pin: 3.3V/2.5V/1.8V digital IO supply. Pins 1-2: 1.8V Pins 2-3: 3.3V
J6	2-3	SGMII/RGMII PHY VDDO_SEL pin. Pins 1-2; '0'=2.5V/3.3V Pins 2-3; '1'(VDDO)=1.8V
J7	1-2	SGMII/RGMII PHY Reset select: Select between Modem controlled GPIO or an onboard power monitor/manual reset. Pins 1-2; Power monitor. Pins 2-3; Modem GPIO.

Table 1 Default Jumper Settings

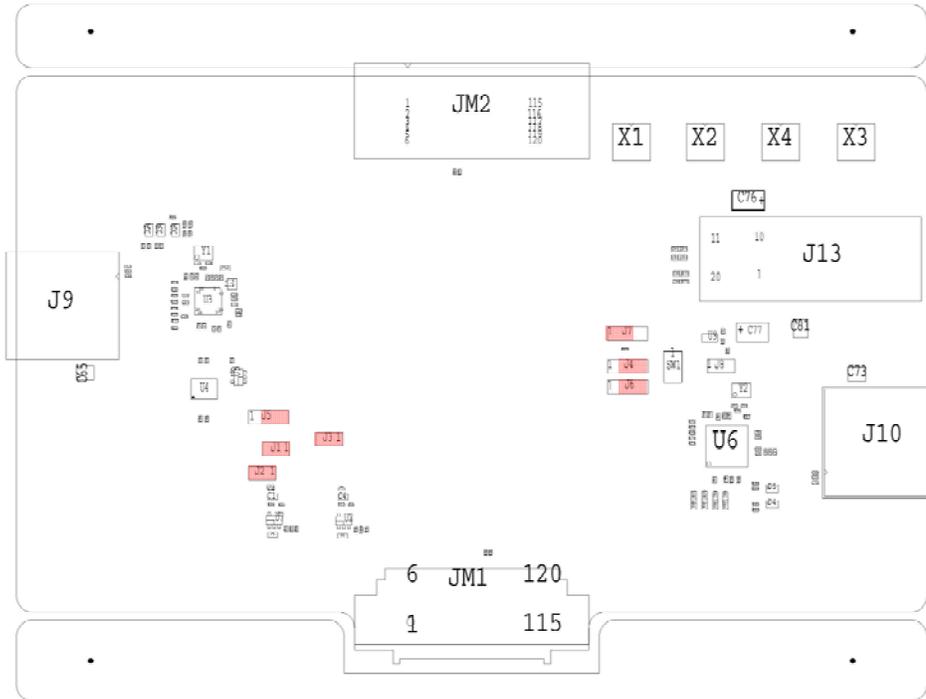
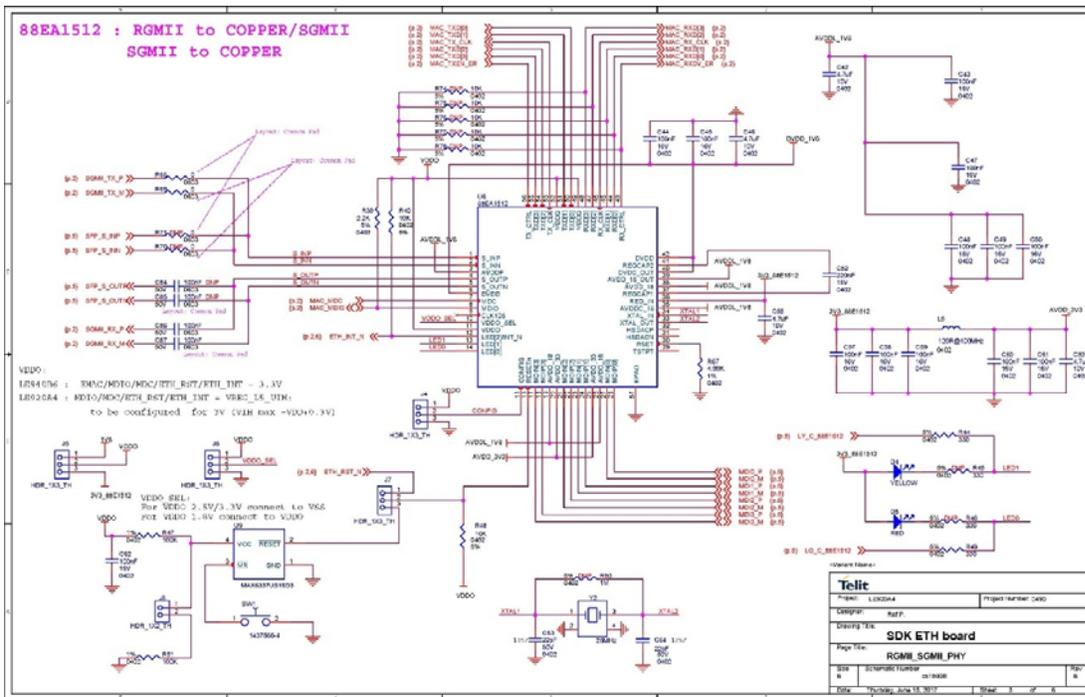
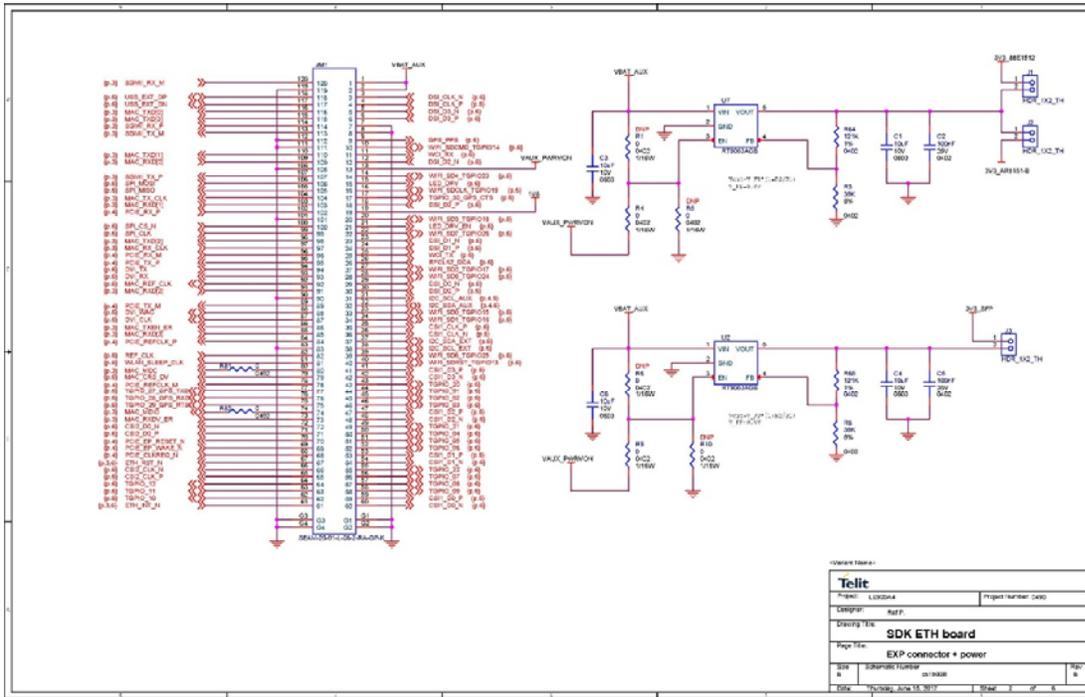
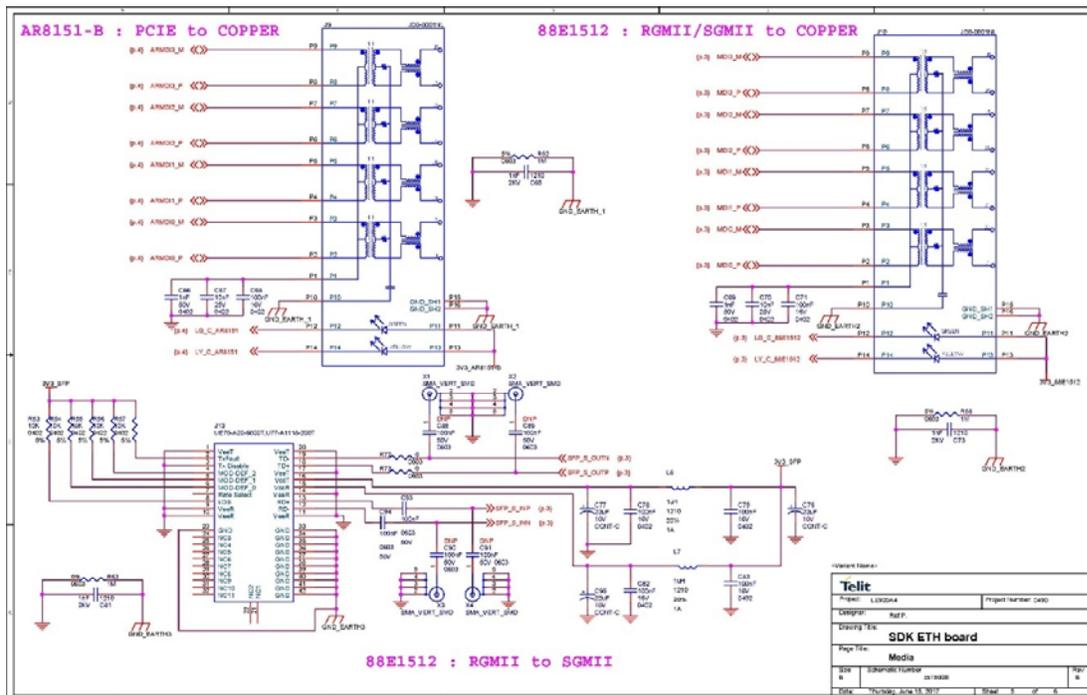
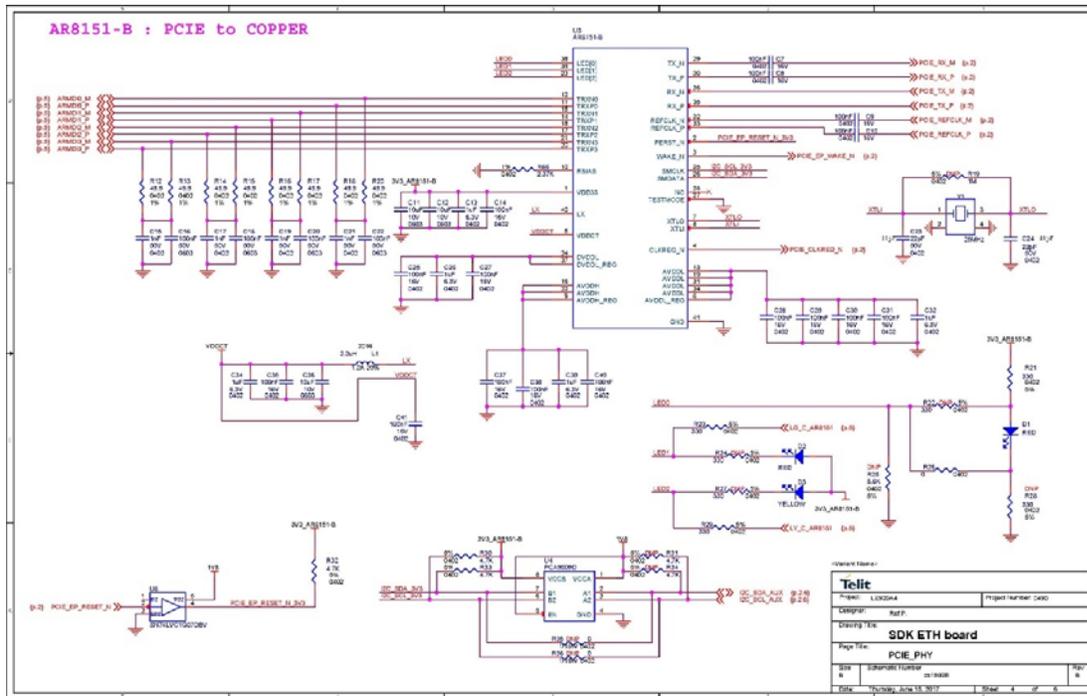
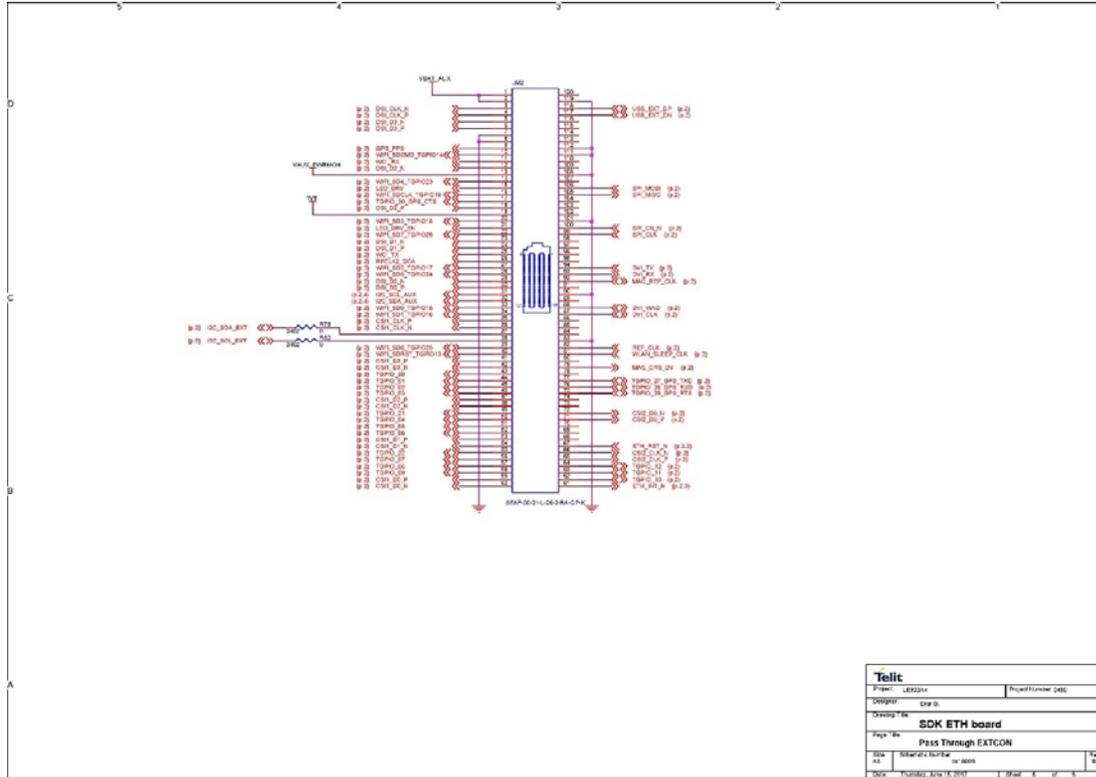


Figure 2-4 Jumpers Locations

2.7. Schematics







3. GLOSSARY AND ACRONYMS

	Description
UART	Universal Asynchronous Receiver Transmitter
SIM	Subscriber Identification Module
SPI	Serial Peripheral Interface
I/O	Input Output
GPIO	General Purpose Input Output
CLK	Clock
PCB	Printed Circuit Board
ETH	Ethernet
SGMII	Serial Gigabit Media-Independent Interface

4. DOCUMENT HISTORY

Revision	Date	Changes
1	2017-10-03	Added connection example console log and screenshots.



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