QCT Rackgo X
OCP Debug Card with LCD

2018/10/15

Agenda

- Overview
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- Mechanical View & Interconnection
- Why Needs This Product
- Key Part Placement
- UART Connection with Host
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Overview

- ## Introduction
  - "QCT Rackgo X OCP Debug Card with LCD" is to intend to ease the debug effort and time consumed. It already has successfully approved the obvious improvement of the service efficiency with various compatible systems, for instance, "Tioga Pass" & "Yosemite V2".

- ## Contributions
  - Design package
  - Product submission to Marketplace
    - Product Recognition: Accepted level

- ## Specification Reference
 - Facebook_OCP_Debug_Card_with_LCD_Spec_v1p0

High Level Features

Product Description	
Prodcut Description	Rackgo X OCP Debug Card with LCD
DImension	
Dimension	70.55 mm(L)x48mm(W)x17.1mm(H)
Electrical Interface	

Electrical Interface	1. USB 3.0 Connector with remapped proprietary singal pin, the USB3.0 connector will downgrade to support USB2.0 speed only
	  --USB2.0
	  --I2C
	  --PRSNT
	  --UART
	2. Micro USB
	3. USB 2.0 type A connector

User interface	
User interface	--**Power/Reset/UART select button** --**5-way switch**: The 5 way switch allows the user to page up or page down through the debug information on LED panel, for example, post code details/system information/BMC critical SEL/critical sensor/user settings --**Bluetooth on/off switch**: Turn the battery power on/off to enable/disable Bluetooth module
LED Indicator	

LED Indicator	1. MCU Heartbeat
	    --Green blink, Heartbeat for the micro controller on debug card
	2. Bluetooth LED
	    --Green, blink at 2Hz if Bluetooth module enabled and no link
	    --Solid Green when Bluetooth connecting or when data transfer
	3. Low Battery LED: red LED on when battery lower than 10%; it's off otherwise

LCD panel	
LCD panel	128x64 dots and can display 8 rows and 16 letters on each row

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Mechanical View & Interconnection

Baseboard IO side
(Tioga Pass)

Debug card
with LCD

- ''Debug card with LCD'' will be plugged to remapped USB3.0 connector of the baseboard by cable connection

70.55mm

48mm

17.1mm

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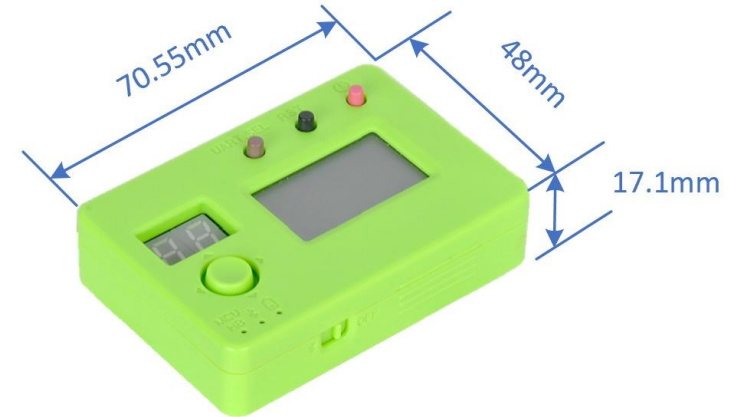
Why Needs This Product

➢ What is the real situation we are facing now

- For data center user: No user friendly debug utility when troubleshooting in their working environment

- For server baseboard designer: Hard to find enough IO space for the debug-purpose I/O ports

• What this product intend to solve

- A text-rich user interface with an LCD for data center user

- Reserve more I/O space of baseboard for features expansion

Key Part Placement

Source:Fcebook_OCP_Debug_Card_with_LCD_Spec_v1p0

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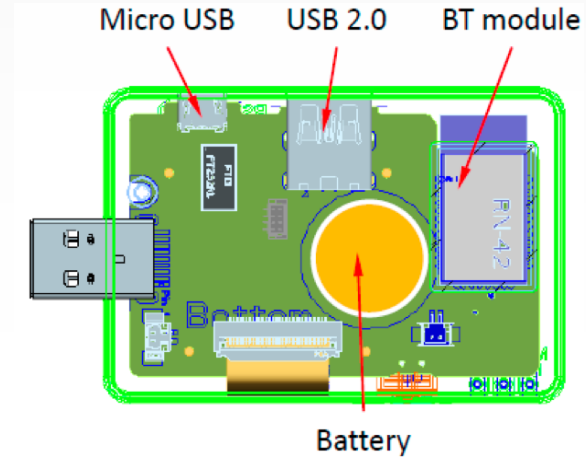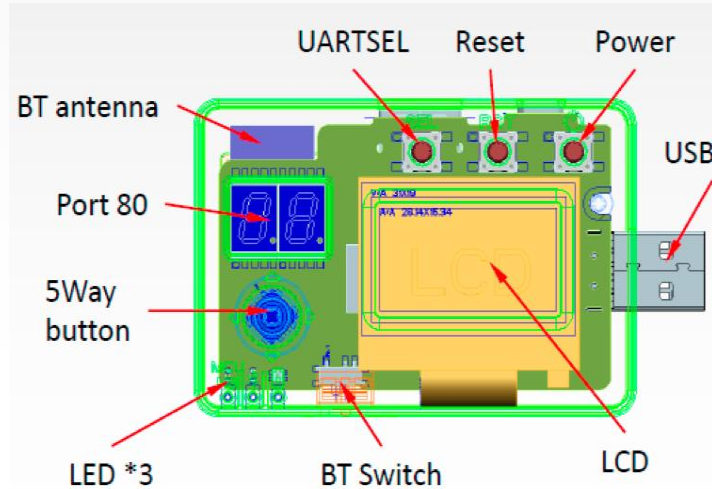
Block Diagram

Source:Fcebook_OCP_Debug_Card_with_LCD_Spec_v1p0

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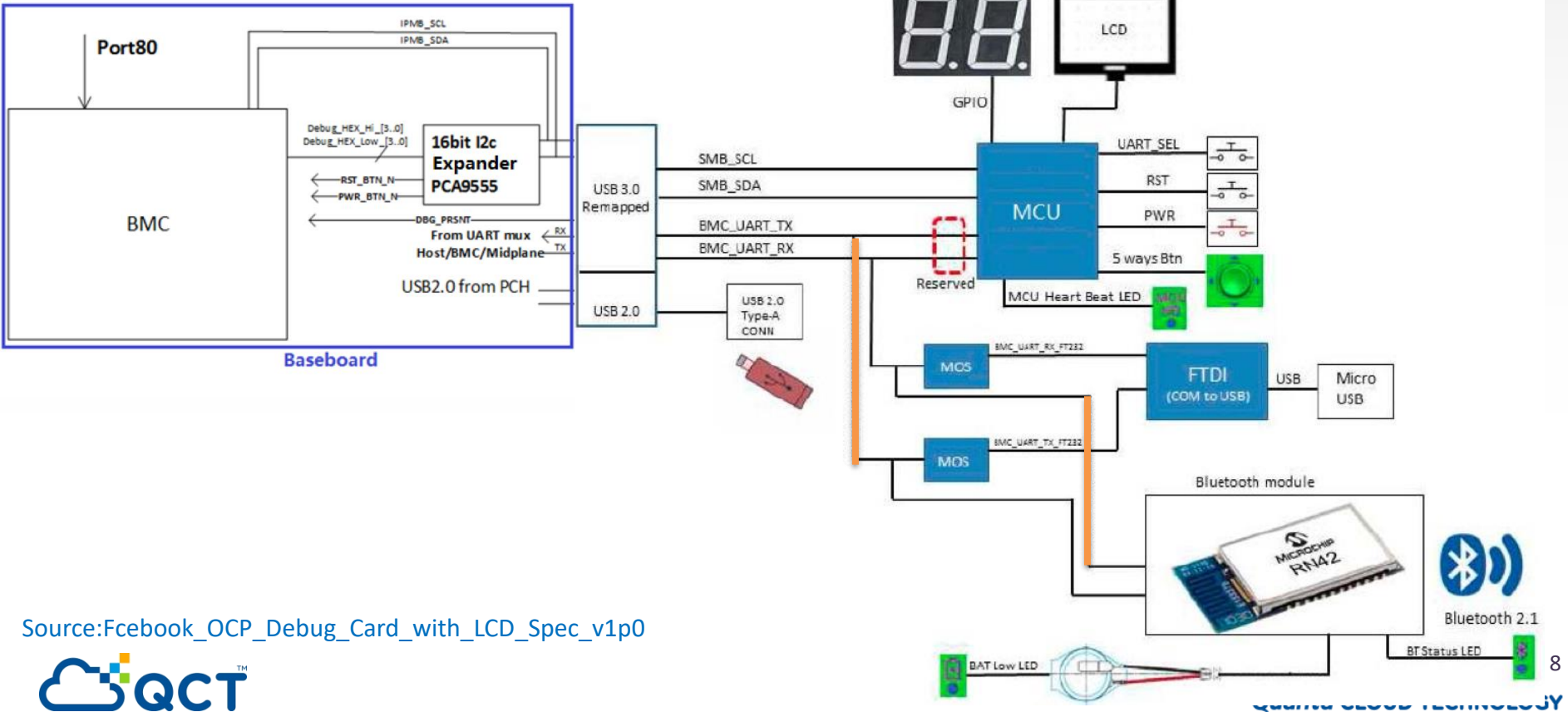
UART Connection with Host

➢ UART Connection between Server Board to host side
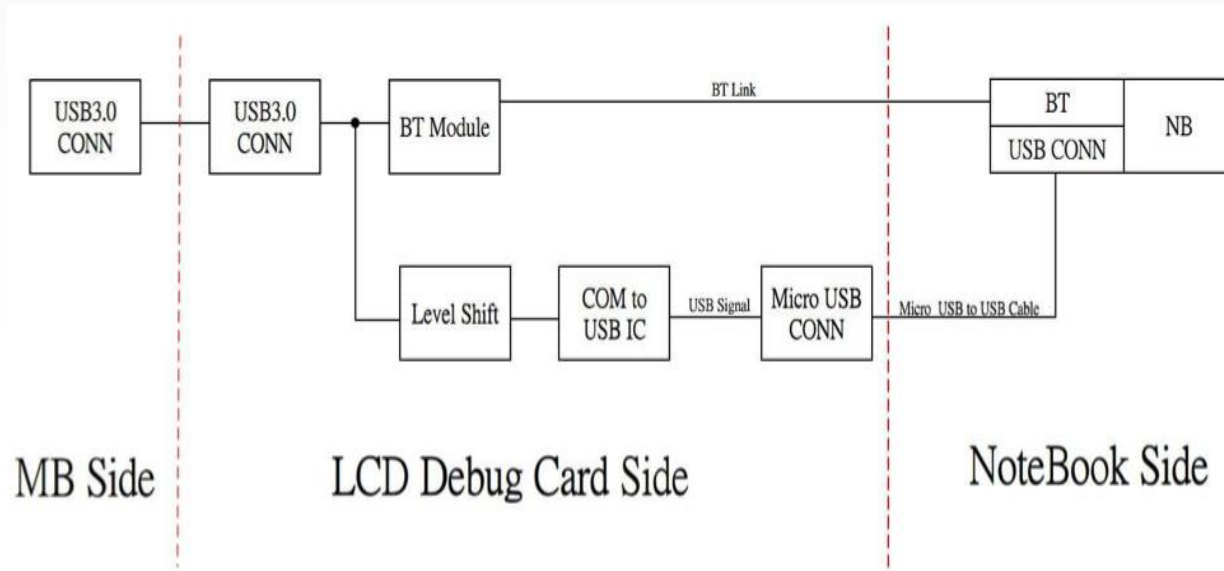
LED Panel Content & Display

- The display provide the information below:
  - POST Code Frame
  - System Info Frame
  - Critical SEL Frame
  - Critical Sensor Frame
  - GPIO Status Frame
- If any sensor is out of the threshold, the whole screen should blink and invert the color for the sensors which out of the threshold

Source:Fcebook_OCP_Debug_Card_with_LCD_Spec_v1p0

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Compatible Components List & User Guide

- ''QCT Rackgo X OCP Debug Card with LCD'' could be operated with
  - Tioga Pass sled
  - Yosemite V2 sled

QCT Rackgo X OCP Debug Card with LCD

Rackgo X Tioga Pass Sled
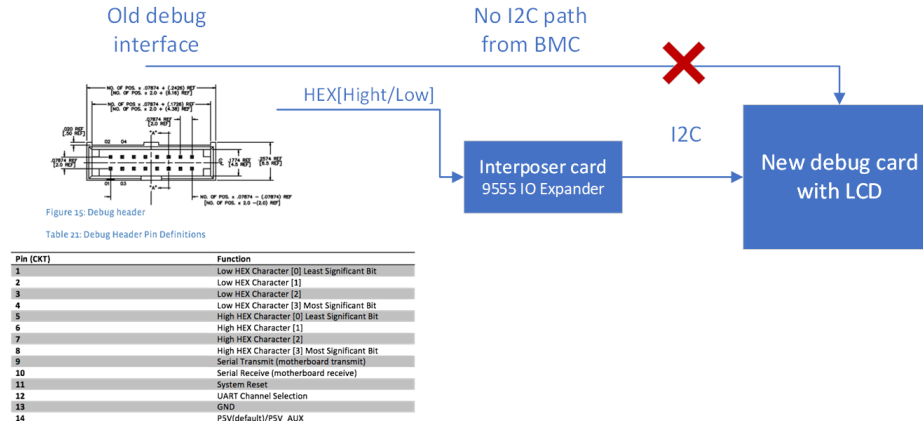
Rackgo X Yosemite V2 Sled

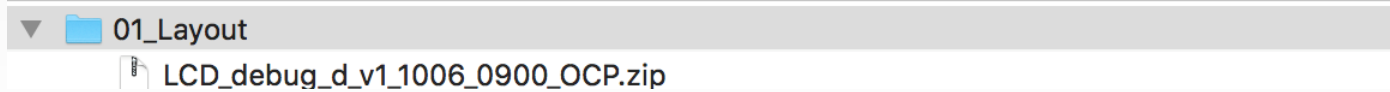# Possibility Of Been Compatible With Previous Generation Platform

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Technically, it is doable to make the previous revision system with old debug interface to communicate with the new revision debug card by adding one PCA9555 in the interposer card. But it is still a limited communication, it cannot completely demonstrate the full function of the new debug card. The reason is as below:

We think the major key design of the new debug card is the serial I2C bus compare to old 14 pin debug card. The LCD debug card is designed to get post code from PCA9555 I/O expander @MB by I2C and get BMC critical event logs from BMC@MB through IPMB, An option is to design a PCA9555 I/O expander in the interposer card, so that the LCD debug card can get post code from this PCA9555@interposer card. However, there is no IPMB in the 14-pin header, but still can't get BMC critical event log if your previous MB design already frozen. Please refer to diagram below, thanks.

Old debug interface

No I2C path from BMC

HEX[Hight/Low]

I2C

Figure 15: Debug header

Table 21: Debug Header Pin Definitions

Pin (CKT)	Function
1	Low HEX Character [0] Least Significant Bit
2	Low HEX Character [1]
3	Low HEX Character [2]
4	Low HEX Character [3] Most Significant Bit
5	High HEX Character [0] Least Significant Bit
6	High HEX Character [1]
7	High HEX Character [2]
8	High HEX Character [3] Most Significant Bit
9	Serial Transmit (motherboard transmit)
10	Serial Receive (motherboard receive)
11	System Reset
12	UART Channel Selection
13	GND
14	P5V(default)/P5V_AUX

Interposer card
9555 IO Expander

New debug card with LCD

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Design Files Contribution-
01_Electricals

➢ 01_Full System Board Layout

> ▼ 📁 01_Layout
>> 📄 LCD_debug_d_v1_1006_0900_OCP.zip

➢02_Full System Schematic CAD

> ▼ 📁 02_LCD Debug Card Schematic CAD
>> ⬛ USB_BT_DEBUG_CARD_0120.DSN
>> ⬛ usb_bt_debug_card_0120.opj
>> 🖼 USB_BT_DEBUG_CARD_D_V1_0915_1500.pdf

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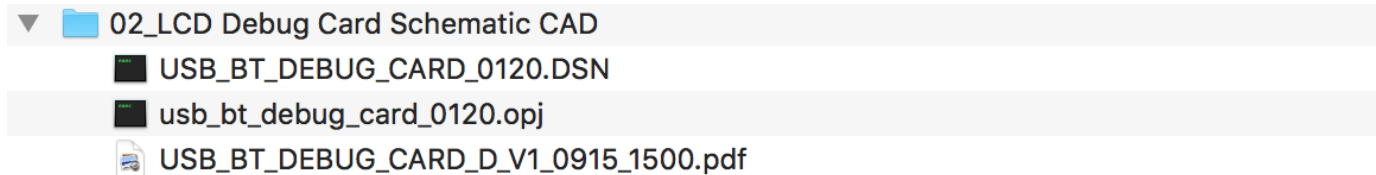
Design Files Contribution-01_Electricals

➢ **03_Full System Component BOM**

- ▼ 📁 03_LCD Debug Card Component BOM
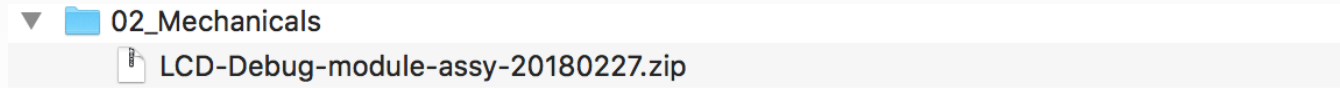 - 📊 LCD Debug Card Component BOM.xlsx

➢ **04_Manufacturing Files**

- ▼ 📁 04_Manufacturing Files
  - ▼ 📁 01_PCB manufacturing files
    - 📄 LCD_debug_d_v1_1006_0900_OCP_gerber.zip
  - ▼ 📁 02_Schematic (.pdf)
    - 📄 USB_BT_DEBUG_CARD_D_V1_0915_1500.pdf
  - ▼ 📁 03_Board component placement map (.pdf)
    - 📄 LCD Debug Card placement map.pdf
  - ▼ 📁 04_Stack Up
    - 📄 (Stackup)Bluetooth_Debug_Card_4L_1p6mm_FR4_Rev0p2_20160308.xls

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Design Files Contribution-02_Mechanicals

➤ Mechanical files

▼ 📁 02_Mechanicals
      📄 LCD-Debug-module-assy-20180227.zip

Design Files Contribution-
03_Software

➢ Software files

```
▼  📁 03_Softwares
   ▼  📁 debug_card_fw_C008_B003_R013
         📄  combo_lcd_4c129_008.bin
         📄  lcd_4c129_013.bin
         📄  lcd_4c129_bootloader_003.bin
         📄  lcd_combo_FW_Release_Note_v008.txt
```
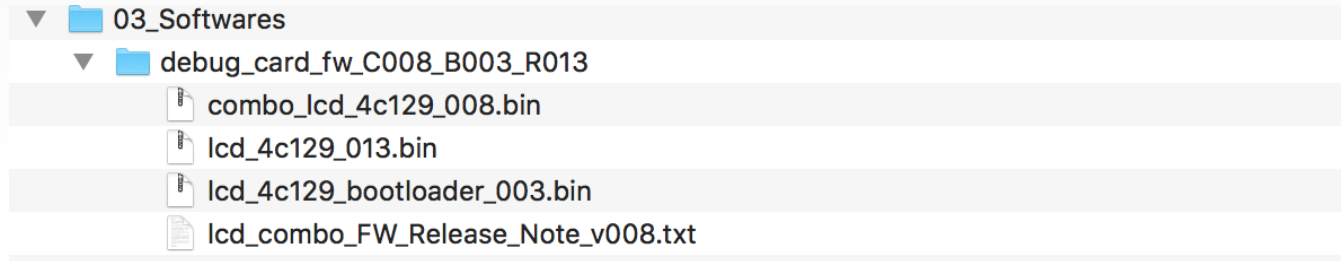
OCP Tenets/Principles

- **Efficiency**
  - To Integrate debug utility & debug message into one small box without separated utilities and extra effort
  - Reserve more front end IO space for more critical IO expansion
- **Scalability**
  - Comply with common debug protocol, like UART, USB
- **Openness**
  - Derive from debug card V1 and with enhanced features
- **Impact**
  - Readable LED & LCD to accelerate the progress of debugging
  - Reserve more I/O space of baseboard by designing with serialized electric interface, like UART/I2C/USB

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Summary

- We have already released our patch code of the debug card to GitHub as below

  - https://github.com/Quanta-Computer/Debug-Card

Thanks!!!

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