RL78/G1D Group

RL78/G1D Solution Kit – Activity Module Hardware Manual

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Rev.1.00
July 31, 2016

Introduction

This document represents Solution Kit's Activity Module. The document describes hardware platform information such as connection interface, RL78/G1D-SK Bluetooth® module interface and its Bluetooth® connectivity, and schematics.

Target Device

RL78/G1D Group and Synergy® Device

This Solution Kit's Activity Module includes power supply, user interface like vibrator, LED, LCD and buttons, accelerometer, light sensor, temperature sensor. The RL78/G1D-SK Target Board or Synergy Module can be added to develop and/or demo the Solution Kit functions.

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1. Overview

Activity Module contains two sections: Sensing and processing. This Activity Module has peripheral sensors as well as provides three board-to-board connectors for interfacing to processing board such as RL78/G1D Target Board [3] and Synergy Board S3 Target Board.

Figure 1 shows top view of the Activity Module and its dimension.

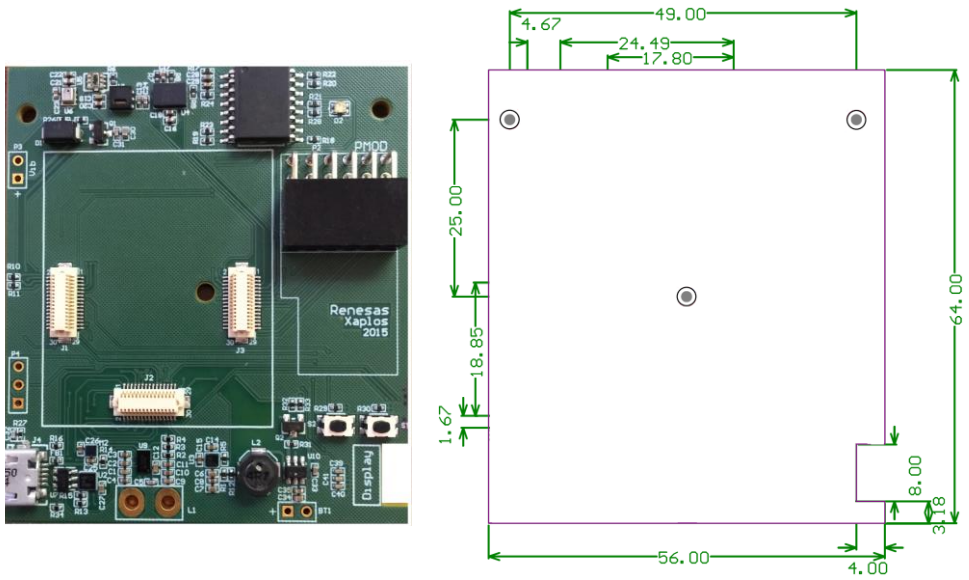


Figure 1 Activity Module

1.1 Specification Outline

The specification of Activity Module is described as below Table 1.

Table 1 RL78/G1D-SK USB Dongle Specification

Item	Content
Dimension	56 mm x 64 mm
Operation Power Supply Voltage	3.3 V
Maximum Power Supply Current	100 mA
Operating Ambient Temperature/Humidity	0°C to +60°C, 10% to 80% RH (non condensing)
Storage Temperature	–15°C to +60°C, 10% to 80% RH (non condensing)

2. Activity Module System

The Activity Module is designed to use with RL78/G1D Solution Kit Target Board or PMOD™ module, which includes RL78/G1D-SK Bluetooth® module. There are three board-to-board connectors to plug in to this Activity Module for Target Board and one right angle 12-pin connector for PMOD module. This module has user interface like LCD, LEDs, switch buttons and vibrator motor; power supply with battery, battery charger, and Fuel Gauge; various sensors such as Accelerometer, Ambient temperature sensor and Light sensor. Figure 2 shows system block diagram of the Activity Module. Its functionality and interface with RL78/G1D target board are listed in Table 2.

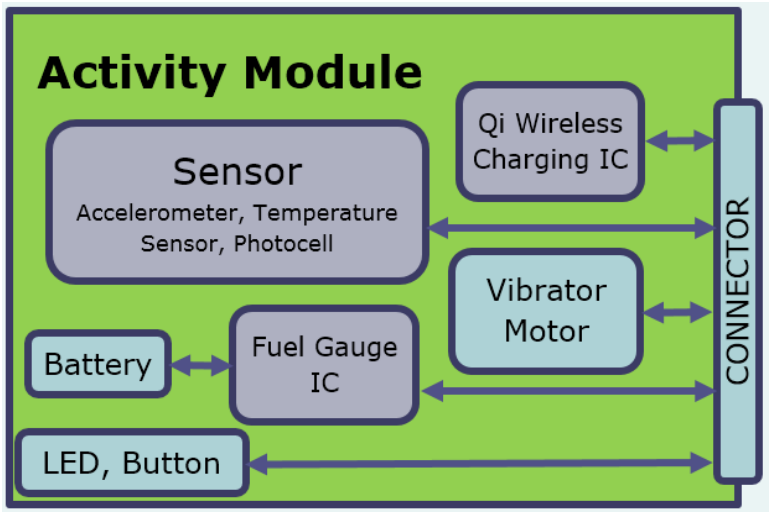


Figure 2 Activity Module system block diagram

Table 2 Activity Module Functionality and Interface

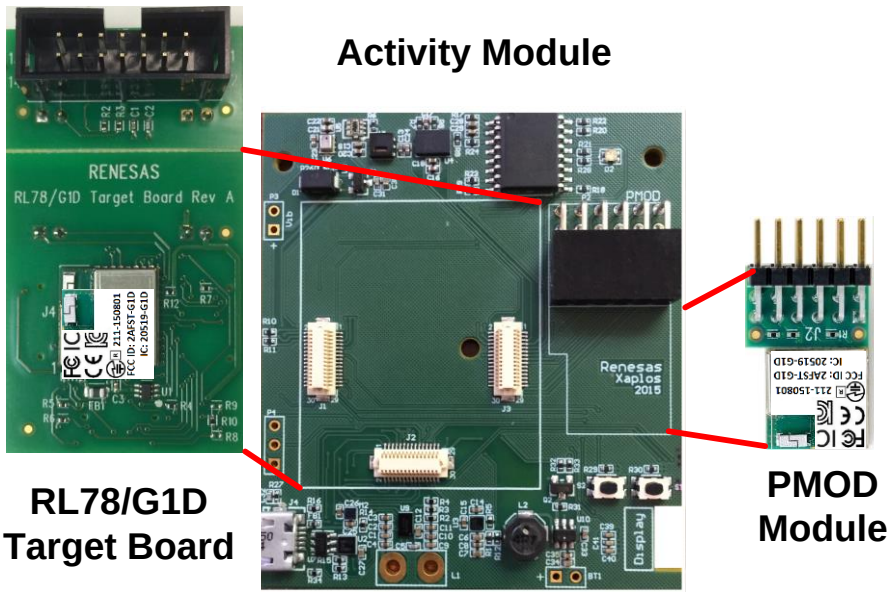
Functionality	RL78/G1D Peripherals	Comments
Display	Not in use	Display buffer transferred over SPI via DTC ending in interrupt; minimizes CPU involvement
Display VCOM	Not in use	Display requires 1 Hz signal at all times; RTCOUT operates across all MCU low power modes
Vibrator Motor	TO04, PWM output	Timer array unit configured to drive PWM signal; lower power to vibrator motor, vary intensity
Backlight for Display	Not in use	Multi-Function timer unit configured to drive PWM signal; lower power to LEDs; vary intensity
LEDs	P40, Output	The LEDs for application indicator
Buttons	P30, P147	Interrupt input P30 and general-purpose input P147 are used as key input active low level.
Ambient Temperature & Light Sensor	SCLA0, I^2C	Dedicated I2C peripheral operating as master

Functionality	RL78/G1D Peripherals	Comments
Accelerometer	CSI00, and control Input, output	BMX055 configured with FIFO so all data transmitted from FIFO by DMA to MCU RAM in data blocks representing X, Y, Z data; 3 programmable interrupts; minimal CPU involvement and overhead
Qi Charger	Not in use	Interrupt indicating battery charging
Fuel Gauge	SCL20, I^2C	Smart single cell fuel gauge to report battery conditions; interrupt or battery low condition
Watch / Clock	RTC	RTC used to update watch as well as trigger alarm events

Note: “Not in use” means that the peripheral is reserved for add-on feature. For detail, refer Electrical Specifications of RL78/G1D User’s Manual: Hardware, R01UH0515EJ0110 [1].

3. Operating Activity Module

This Activity Module can be used as development platform with either RL78/G1D Solution Kit- Target board or Synergy S3 target board. When use with Synergy target board, use PMOD module for Bluetooth® communication. The RL78/G1D target board has adaptor with 14-pin E1 programmer/debugger connector. Using E1, you can debug or program to the target board. Refer Renesas website for using E1 programmer/debugger tool and detail project development.



– **Figure 3 Activity Module pin configuration**

– Power Supply

The Activity Module has Qi wireless charging system, USB Battery charger and Fuel Gauge along with Lithium-ion Battery. It can detect the target board's power supply whether supports 5 volt or 3.3 volt. If the target processing board is available 5-volt power supply, the onboard 3.3-volt power supply will shut down automatically.

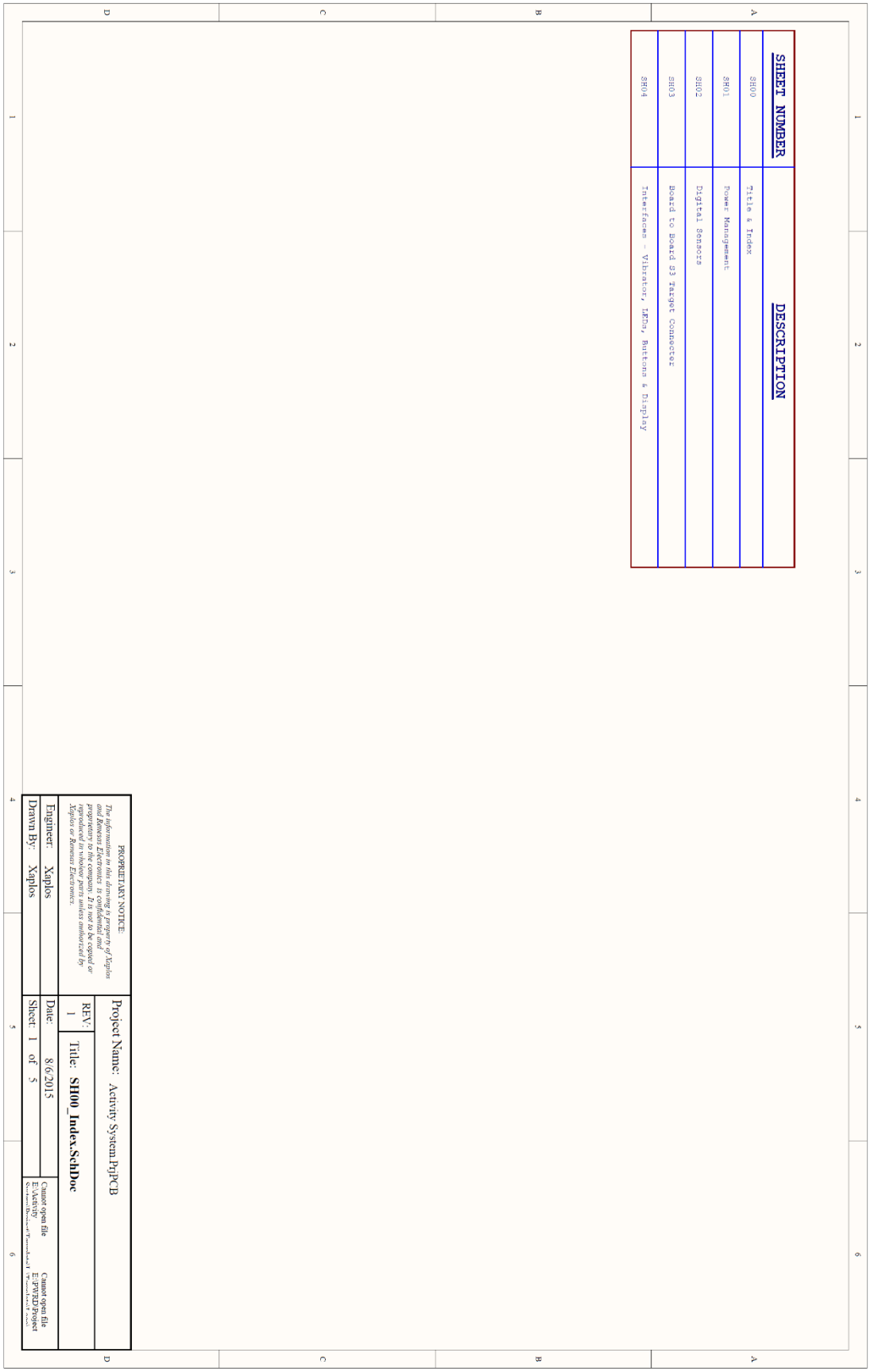
– User Interface

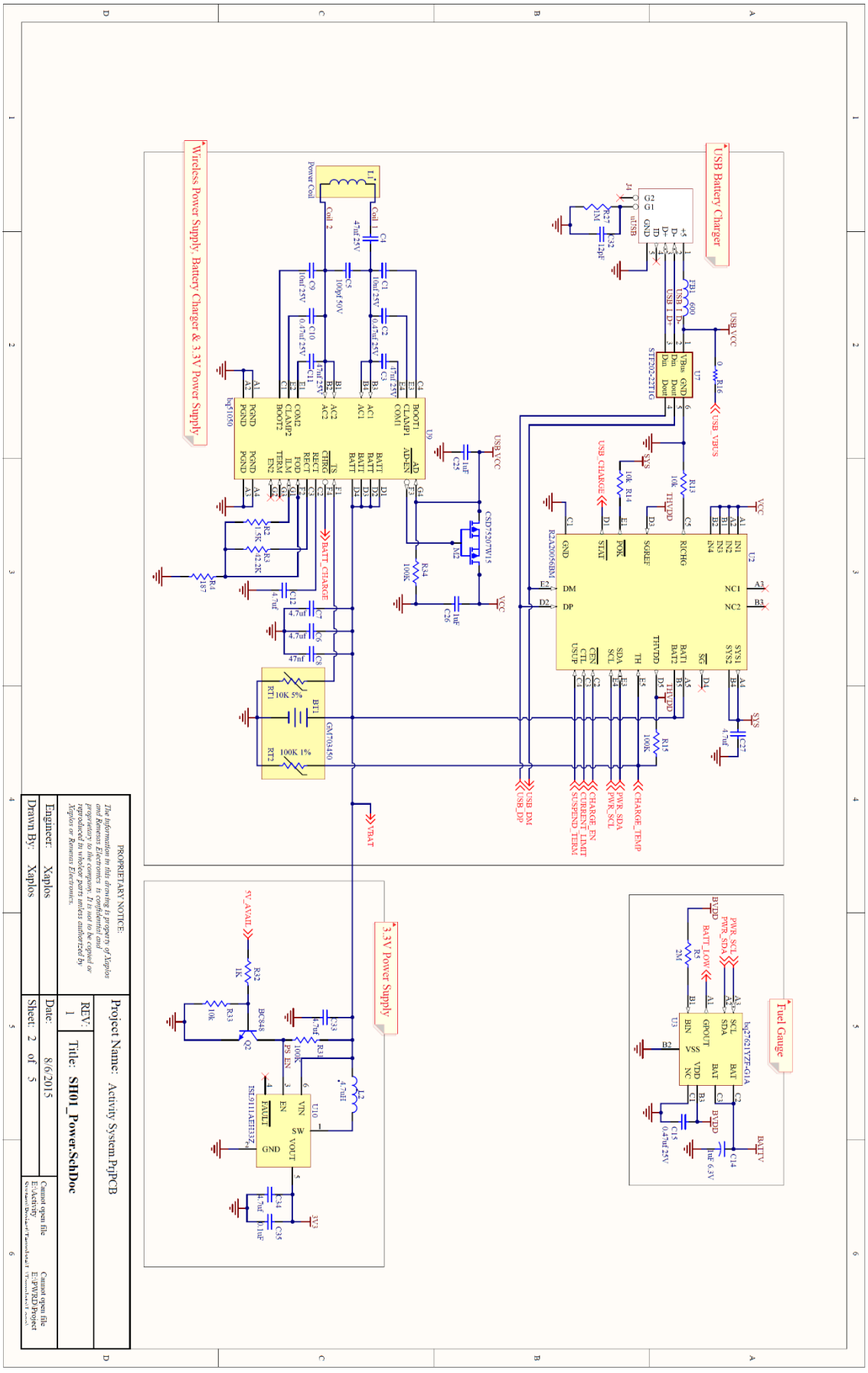
The Activity Module has two active low push buttons; one dual-color LED (Blue and Red), one LCD and one vibrator for user interface system. The LCD display is add-on feature.

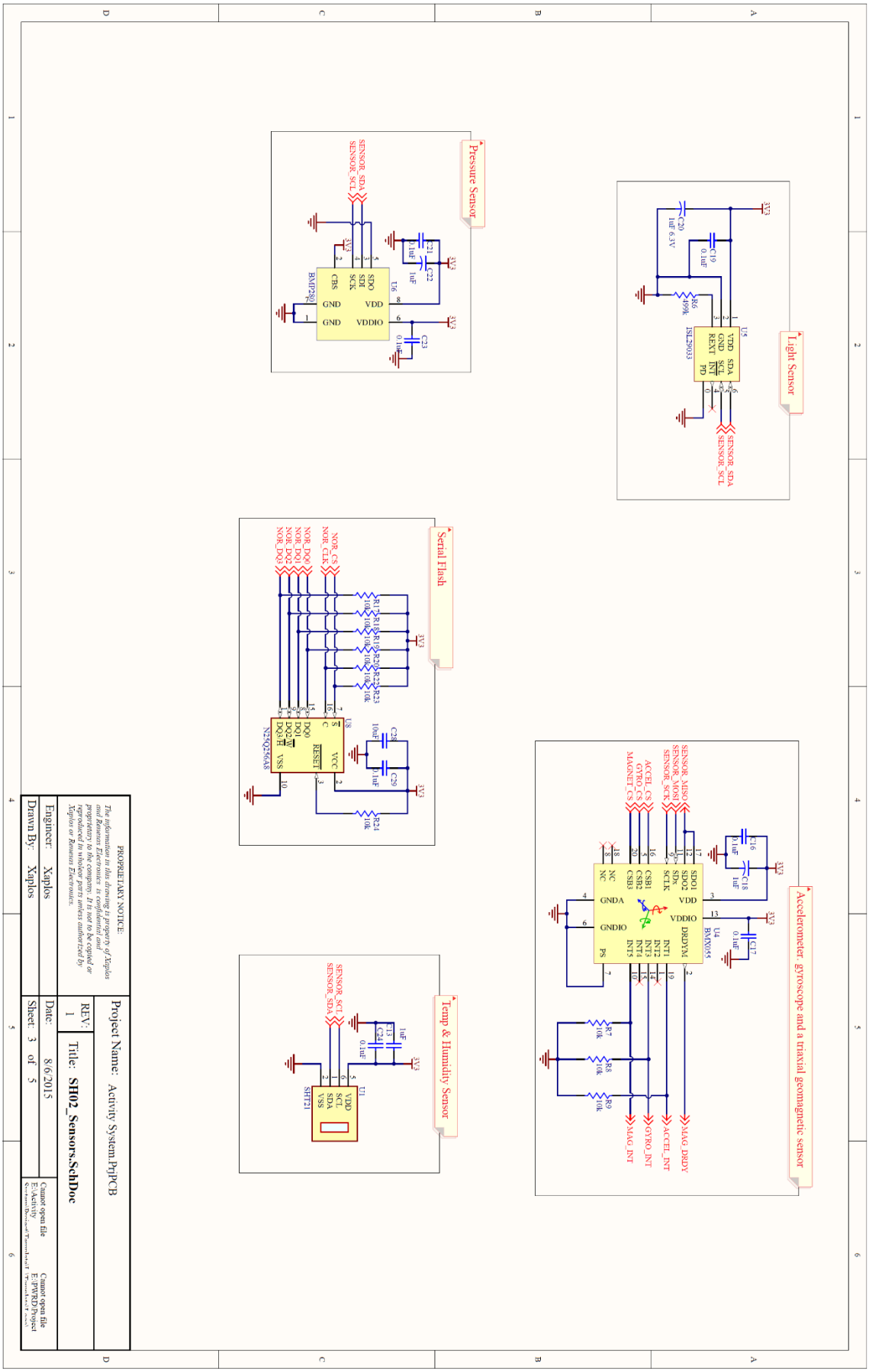
– Sensor

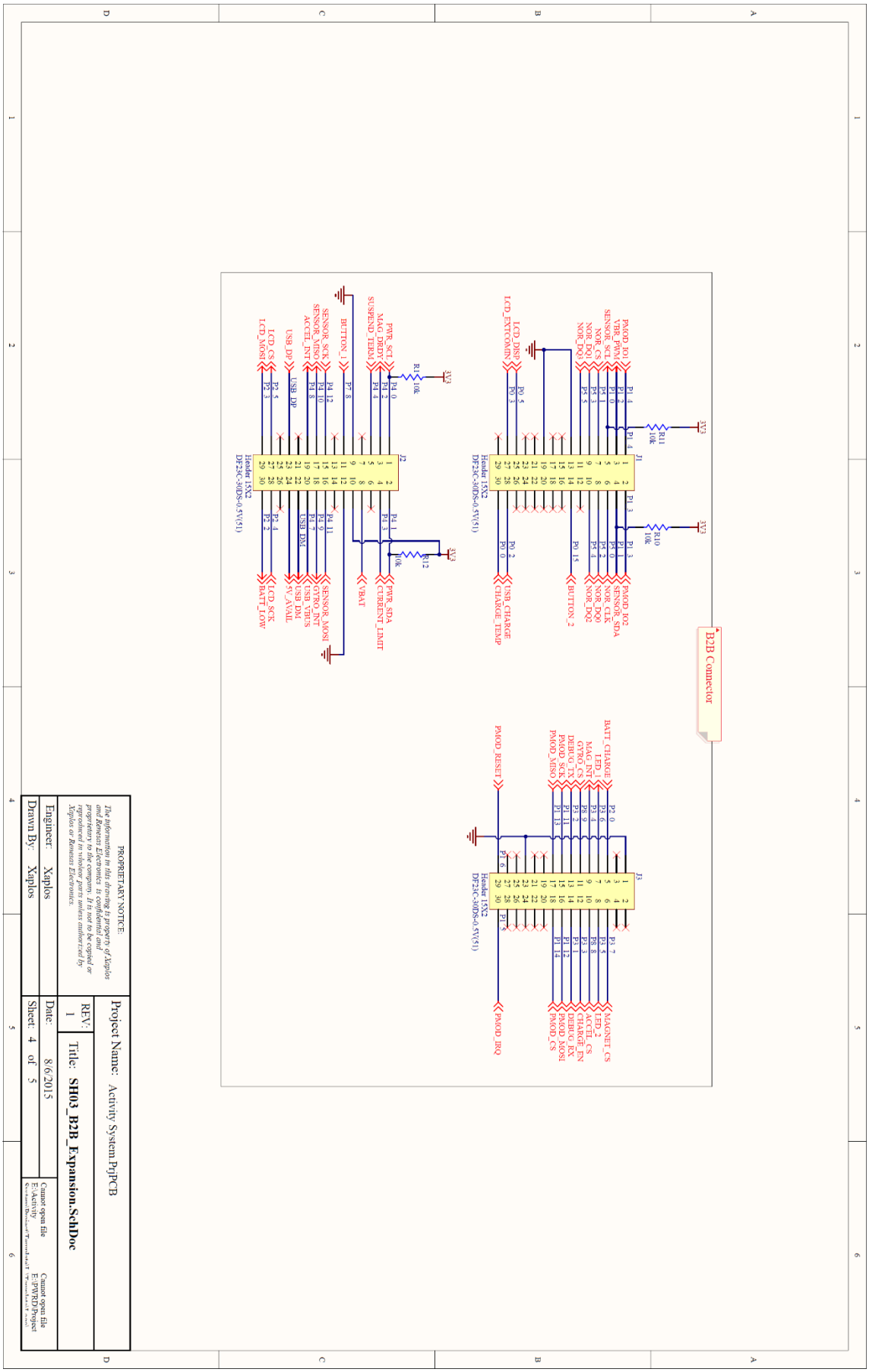
For ambient sensing, the Activity Module includes accelerometer for gyroscope and triaxial geomagnetic sensing, one sensor for temperature and humidity sensing, one light sensor, and one pressure sensor.

4. Circuit Diagrams




Wireless Power Supply, Battery Charger & 3.3V Power Supply
USB Battery Charger
3.3V Power Supply
Fuel Gauge
Project Name: Activity System.PrjPCB
Title: SH01_Power.SchDoc
Engineer: Xaplos
Drawn By: Xaplos
Date: 8/6/2015
Sheet: 2 of 5
REV: 1
PROPRIETARY NOTICE:


Pressure Sensor
Light Sensor
Serial Flash
Temp & Humidity Sensor
Accelerometer, gyroscope and a triaxial geomagnetic sensor
PROPRIETARY NOTICE:
Project Name: Activity System.PrjPCB
REV: 1
Title: SH02_Sensors.SchDoc
Engineer: Xaplos
Drawn By: Xaplos
Date: 8/6/2015
Sheet: 3 of 5


B2B Connector
J1
J2
J3
Header 15X2
DF23C-30DS-0.5V(51)
PROPRIETARY NOTICE:
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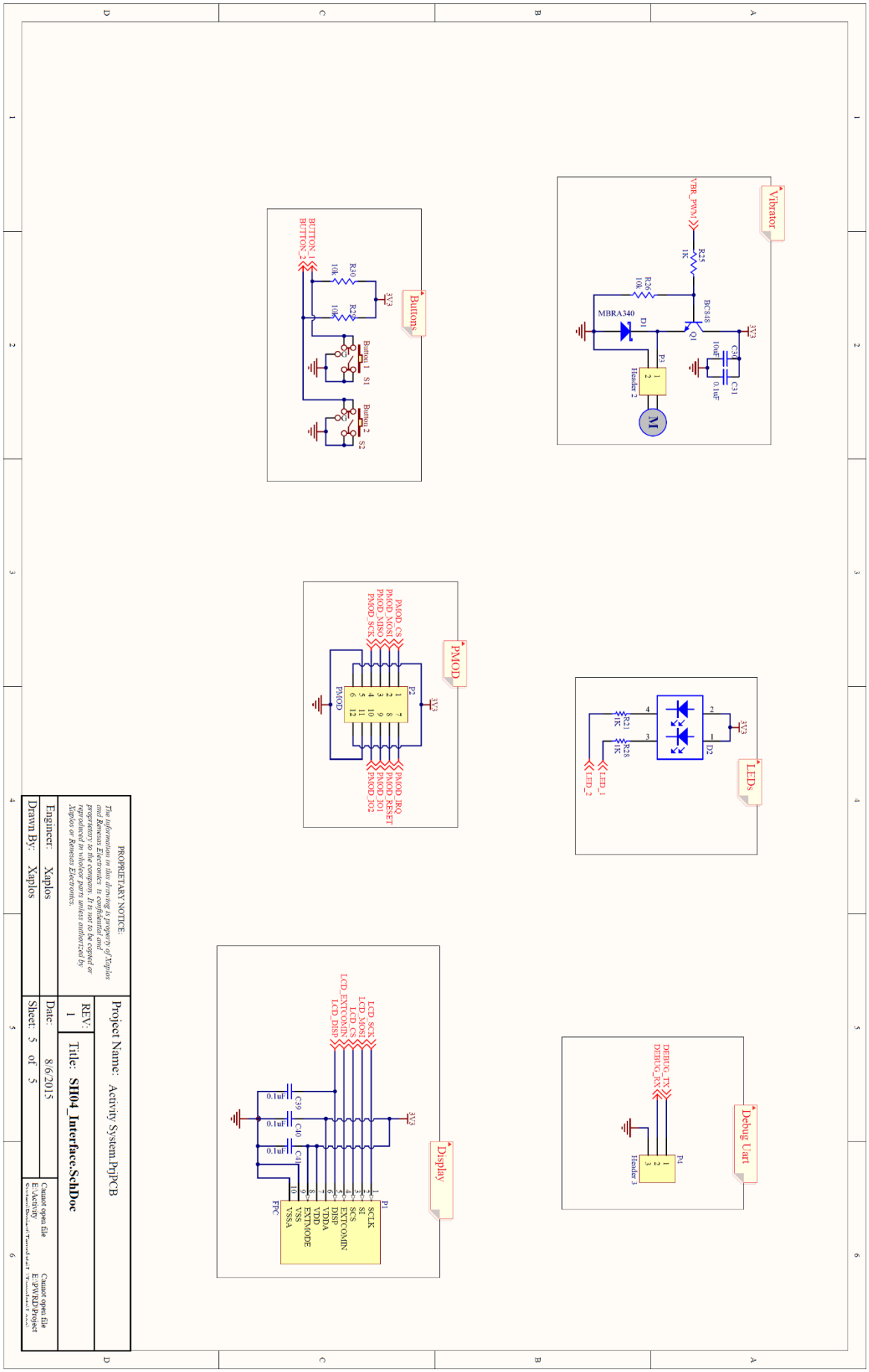
Project Name: Activity System.PrjPCB
REV: 1
Title: SH03_B2B_Expansion.SchDoc
Engineer: Xaplos
Drawn By: Xaplos
Date: 8/6/2015
Sheet: 4 of 5
Cannot open file E:\Activity
Cannot open file E:\PWRD\Project


Vibrator
Buttons
PMOD
LEDs
Display
Debug Uart
PROPRIETARY NOTICE:
Project Name: Activity System.PrjPCB
REV: 1
Title: SH04_Interface.SchDoc
Engineer: Xaplos
Drawn By: Xaplos
Date: 8/6/2015
Sheet: 5 of 5

Appendix A - References

[1] RL78/G1D User's Manual: Hardware, R01UH0515EJ0110 Rev.1.10, Sep 25, 2015

[2] Bluetooth® Low Energy Protocol Stack User's Manual, R01UW0095EJ0117 Rev.1.17, Apr 17, 2015

[3] RL78/G1D Solution Kit-Target Board Hardware Manual, R01AN2958EU0100_RL78G1D Rev.1.00, July 31, 2016

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		Description	
Rev.	**Date**	**Page**	**Summary**
1.00	July 31, 2016	—	First edition issued

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1. Handling of Unused Pins

   Handle unused pins in accordance with the directions given under Handling of Unused Pins in the manual.

   — The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible. Unused pins should be handled as described under Handling of Unused Pins in the manual.

2. Processing at Power-on

   The state of the product is undefined at the moment when power is supplied.

   — The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the moment when power is supplied.
   In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the moment when power is supplied until the reset process is completed.
   In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the moment when power is supplied until the power reaches the level at which resetting has been specified.

3. Prohibition of Access to Reserved Addresses

   Access to reserved addresses is prohibited.

   — The reserved addresses are provided for the possible future expansion of functions. Do not access these addresses; the correct operation of LSI is not guaranteed if they are accessed.

4. Clock Signals

   After applying a reset, only release the reset line after the operating clock signal has become stable. When switching the clock signal during program execution, wait until the target clock signal has stabilized.

   — When the clock signal is generated with an external resonator (or from an external oscillator) during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Moreover, when switching to a clock signal produced with an external resonator (or by an external oscillator) while program execution is in progress, wait until the target clock signal is stable.

5. Differences between Products

   Before changing from one product to another, i.e. to a product with a different part number, confirm that the change will not lead to problems.

   — The characteristics of Microprocessing unit or Microcontroller unit products in the same group but having a different part number may differ in terms of the internal memory capacity, layout pattern, and other factors, which can affect the ranges of electrical characteristics, such as characteristic values, operating margins, immunity to noise, and amount of radiated noise. When changing to a product with a different part number, implement a system-evaluation test for the given product.

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