ESP32-MeshKit-Sense Hardware Design Guidelines

Version 1.0

Espressif Systems

About This Guide

These guidelines refer to the block diagram, PCB layout and function modules of the development board ESP32-MeshKit-Sense.

Revision History

For the revision history of this document, please refer to the last page.

Documentation Change Notification

Espressif provides email notifications to keep customers updated on changes to technical documentation. Please subscribe at www.espressif.com/en/subscribe.

Certification

Download certificates for Espressif products from www.espressif.com/en/certificates.

Disclaimer and Copyright Notice

Contents

List of Tables

List of Figures

1. Overview

ESP32-MeshKit-Sense is a development board with an ESP32 module at its core. It is integrated with peripherals, such as a temperature and humidity sensor, an ambient light sensor, and screens. The board is mainly used to detect the current consumption of ESP32 modules in a normal operation state or in sleep mode, when connected to different peripherals.

For more information on ESP32, please refer to ESP32 Datasheet.

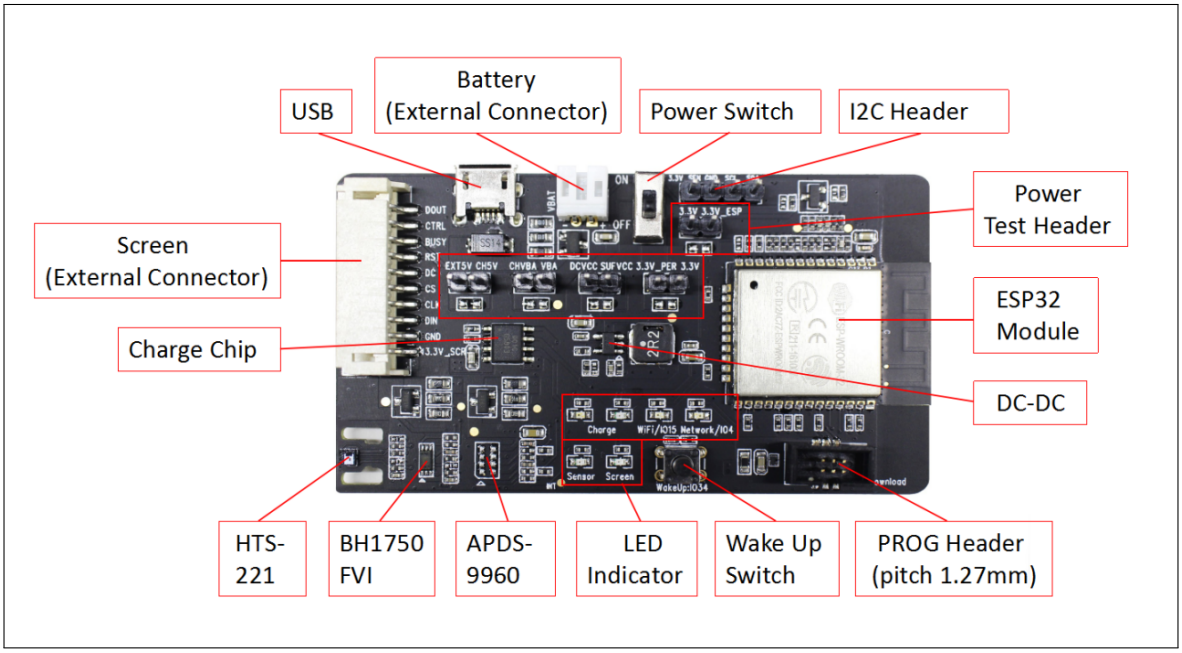

Figure 1: ESP32-MeshKit-Sense

2. Block Diagram and PCB Layout

2.1 Block Diagram

Figure 2 shows the block diagram of ESP32.

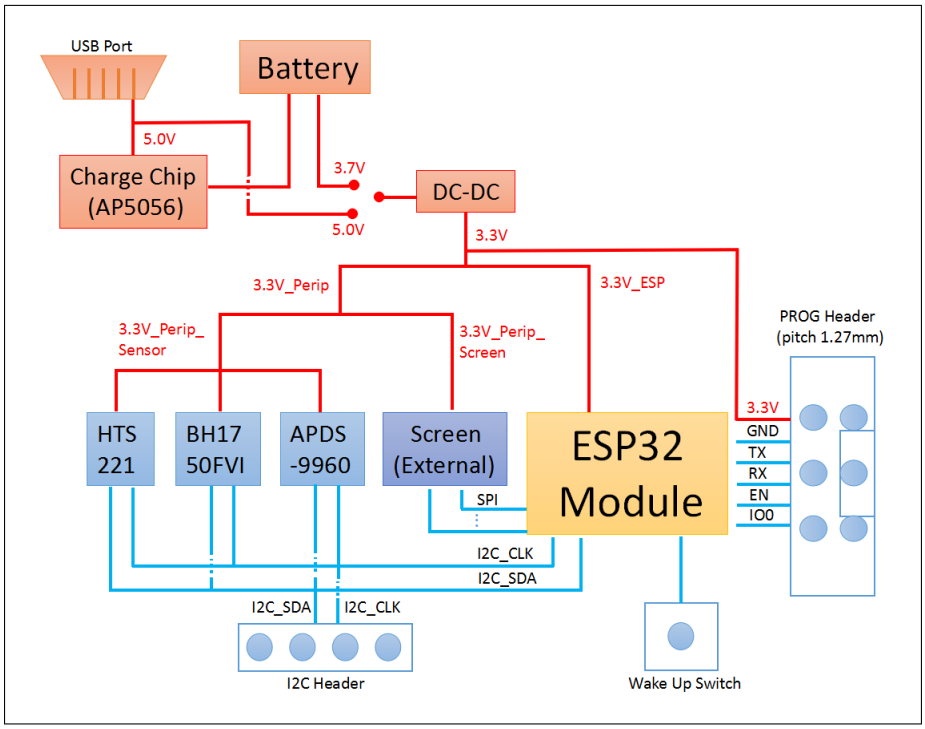

Figure 2: ESP32-MeshKit-Sense Block Diagram

2.2 PCB Layout

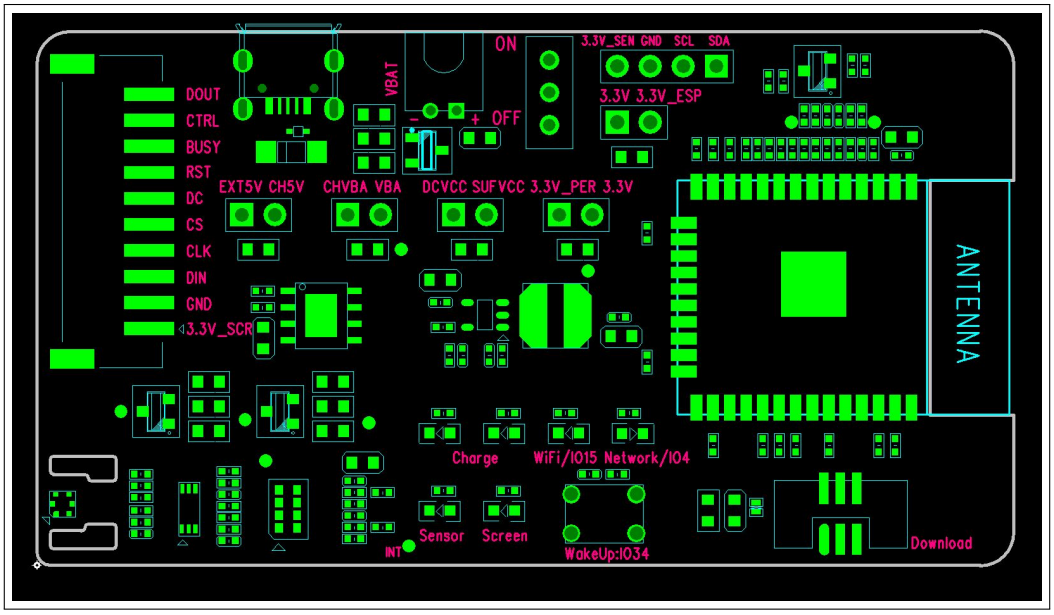

Figure 3: ESP32-MeshKit-Sense PCB Layout

Table 1: Functional Description of PCB Layout

PCB Elements	Description
EXT5V	5V input from USB
CH5V	Input from charge management IC
CHVBA	Output from charge management IC
VBA	Connects to the positive electrode of the battery
SUFVCC	When the switch is toggled to the ”ON” position, it is connected to the power input. When the switch is toggled to the ”OFF” position, the power supply is disconnected.
DCVCC	Input from power management chip DC-DC
3.3V	3.3V output from power supply management chip
3.3V_PER	3.3V power supply for all peripherals
3.3V_ESP	3.3V power supply for all ESP32 modules
3.3V_SEN	3.3V power supply for the three on-board sensors
3.3V_SCR	3.3V power supply for the off-board screen
Charge	Battery charging indicator: When D5 gets red, it indicates that charging is in progress. When D6 gets green, it indicates that charging is complete.
Sensor	Power indicator, showing that the 3.3V_Perip_Sensor is enabled
Screen	Power indicator, showing that the 3.3V_Perip_Screen is enabled
WiFi / IO15	Signal indicator, showing that Wi-Fi connection is working properly
Network / IO4	Signal indicator, showing the board is properly connected to the server

3. Function Modules

This chapter describes each function module (interface) and their hardware schematics.

3.1 Power Supply Management Module

3.1.1 USB/BAT Power Supply Management

The development board can be powered by battery, while the AP5056 power management chip is used for charging the battery. AP5056 is a constant-current and constant-voltage linear charger for single cell lithium-ion batteries. It has 4.2V of preset charge voltage and 1A of programmable charge current.

When both the USB power supply and the battery power supply are available, the system selects its power supply like this: VBUS is high, and Q4 is in a cut-off state, so VBAT (battery power supply) is automatically cut off, allowing the USB to provide power to the system. Please see 4 for the schematics.

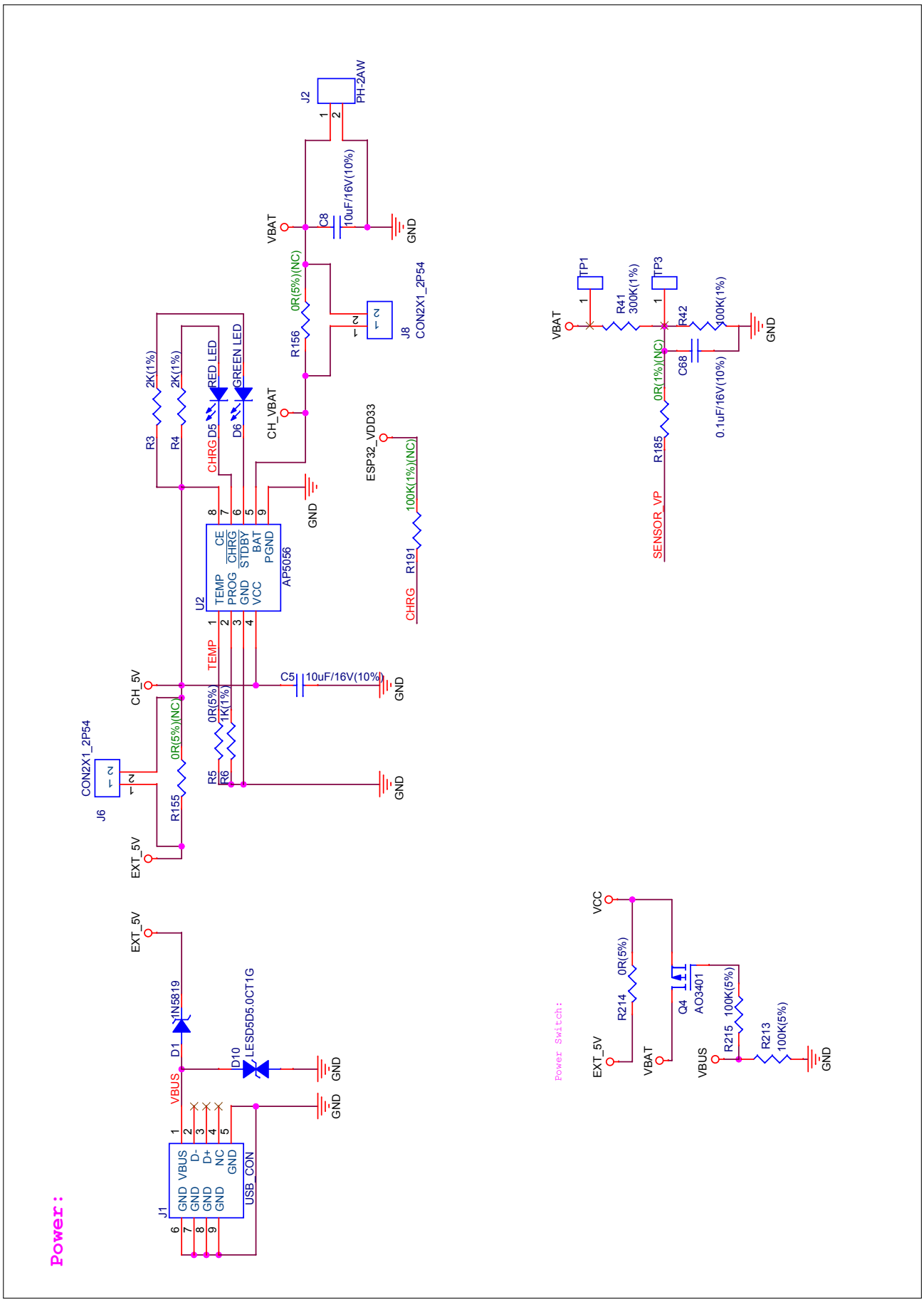

Figure 4: USB/BAT Power Supply Management Schematics

3.1.2 Power Supply Management for Peripherals

First of all, the input from the USB or BAT is converted by the power management IC into the 3.3V voltage that powers the circuit. The power management IC on the board is ETA3425, which has an output voltage of 3.3V and a maximum output current of 600 mA.

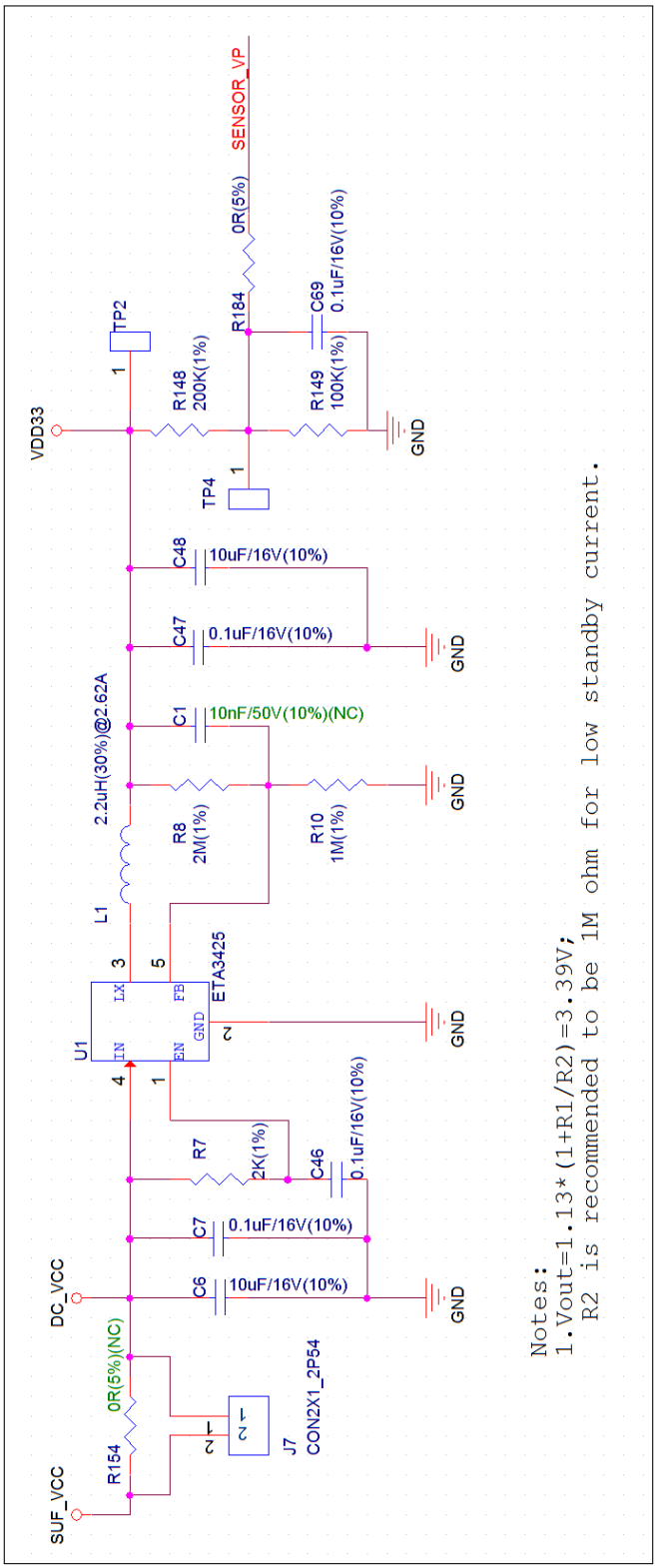

Figure 5: Peripheral Power Supply Schematics

The main VDD33 circuit has two branches: The one is ESP32_VDD33, which is used to power the ESP32 module. The other is VDD33_PeriP, which is used to power all peripherals. The connection between the two branches can be controlled via the pin header and jumper cap.

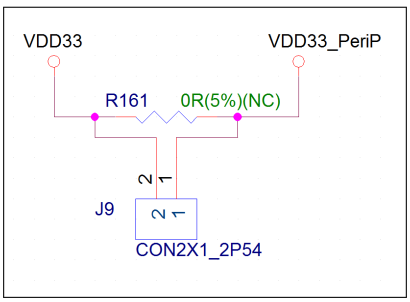

Figure 6: ESP32_VDD33 Schematics

The VDD33_PeriP branch circuit also has two sub-branches: The one is VDD33_PeriP_Screen, a dedicated power supply for the external screen; and the other is VDD33_PeriP_Sensor, functioning as power supply to the three sensors. The connection of the two sub-branches can be controlled by module GPIO+MOS.

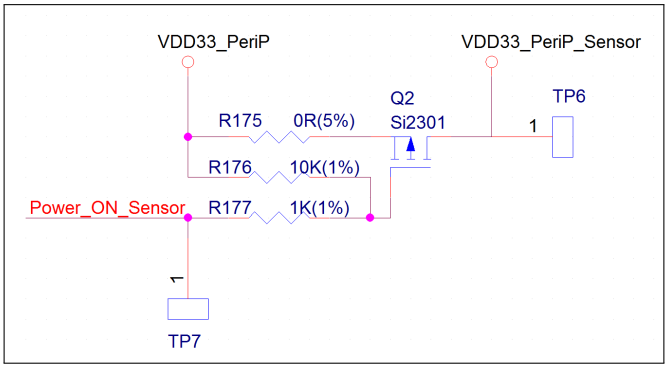

Figure 7: VDD33_PeriP Schematics

3.2 Boot & UART

The development board is integrated with a PROG Header, which can be connected to an ESP-PROG development board via a cable. Users can then connect the Micro USB of the ESP-PROG development board to a PC for ESP32-MeshKit-Sense firmware download and debugging.

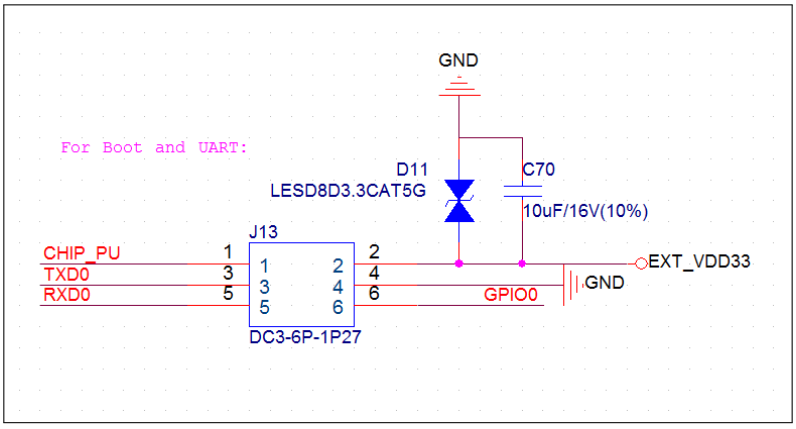

Figure 8: Boot & UART Circuit Schematics

3.3 Module for Wakeup from Sleep

The board has a button connected to pin IO34, which is a pin in the RTC domain. When the chip is in sleep mode, pressing the button will wake up ESP32.

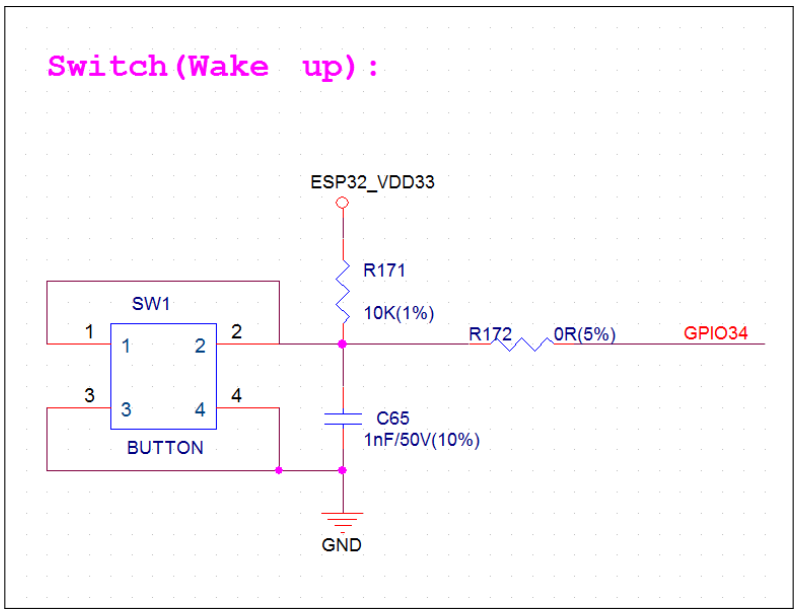

Figure 9: Schematics for Wakeup-from-Sleep Module

3.4 External Screens

The development board is integrated with a screen connector that can connect different external screens to the board via cables.

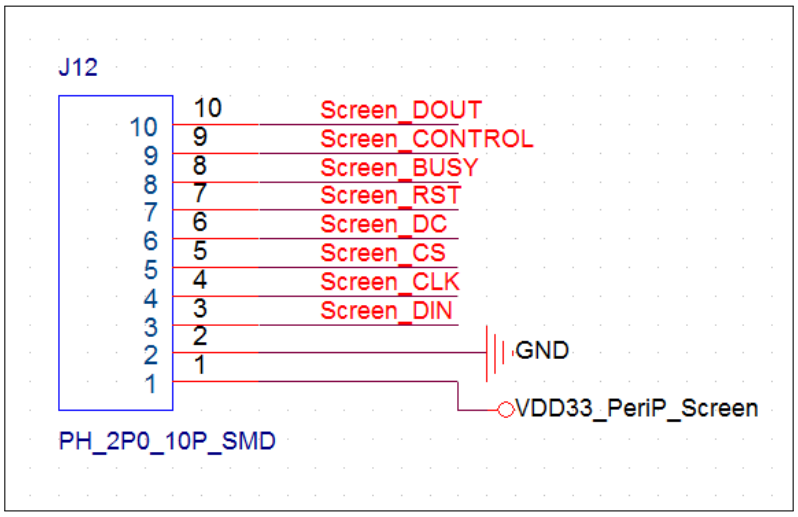

Figure 10: Schematics for External Screens

3.5 Sensors

3.5.1 Temperature and Humidity Sensor

HTS221 is an ultra-compact sensor for relative humidity and temperature. HTS221 uses a 3.3V power supply and a I2C interface on the board.

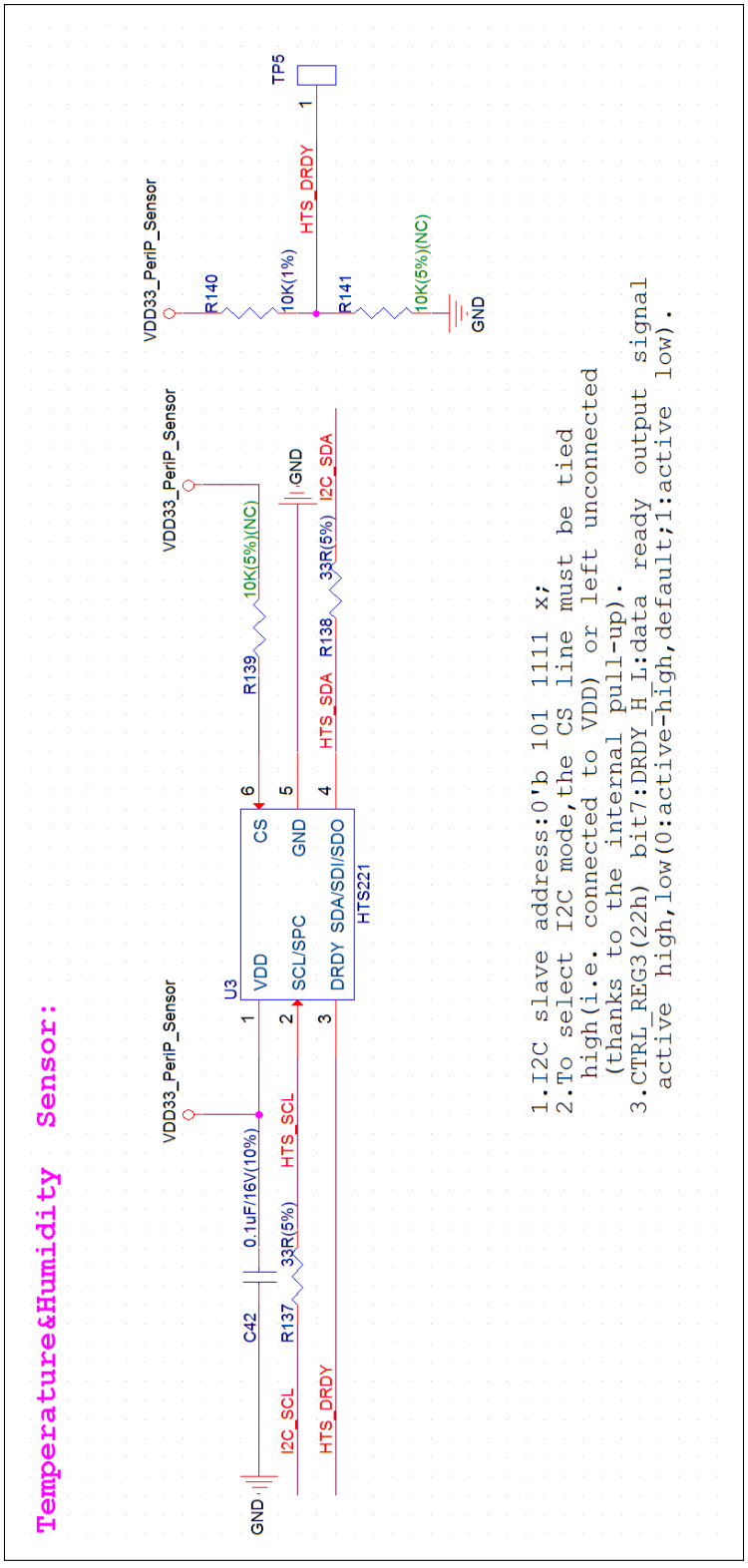

Figure 11: Schematics for Temperature and Humidity Sensor

3.5.2 Ambient Light Sensor

The BH1750FVI is a digital ambient light sensor. BH1750FVI uses a 3.3V power supply and an I2C interface on the board.

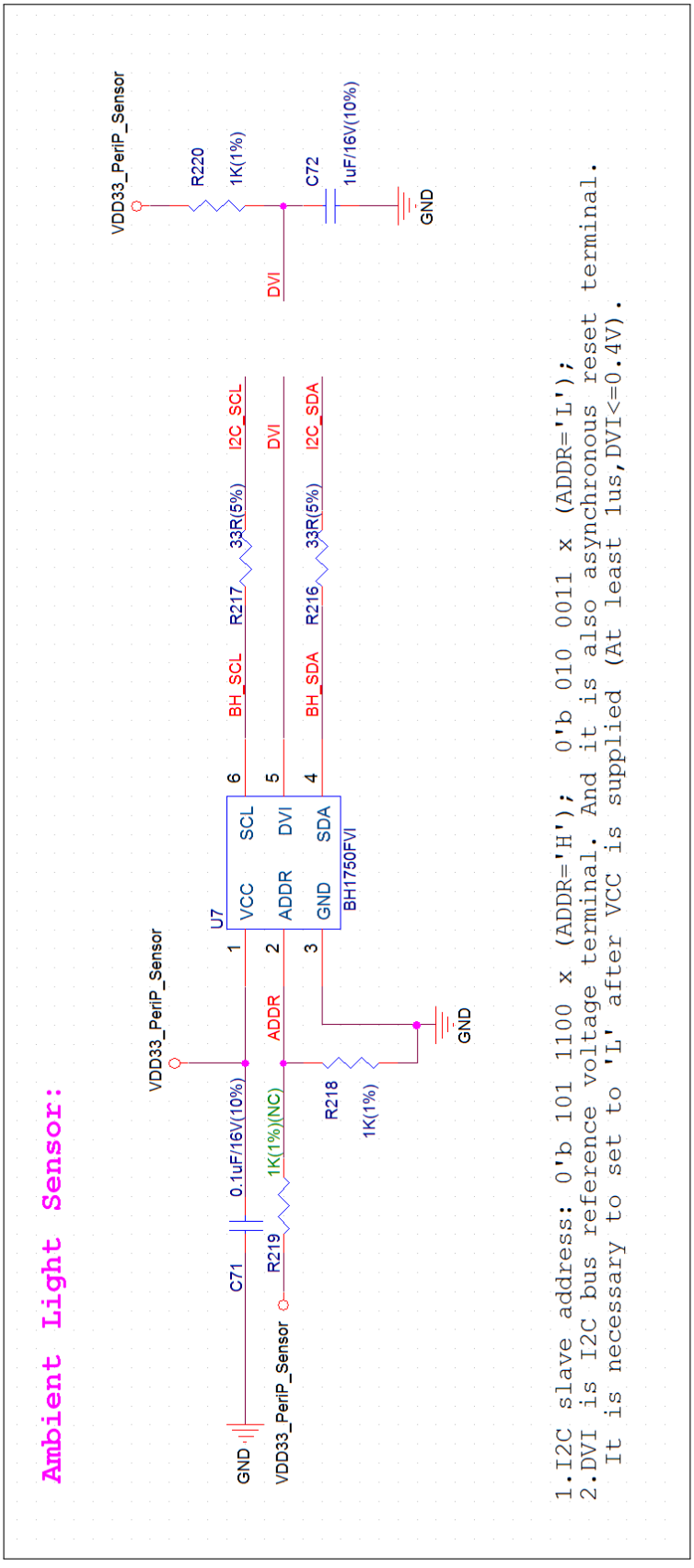

Figure 12: Schematics for Ambient Light Sensor

3.5.3 Ambient Light Sensor

APDS-9960 is an optical module with integrated Ambient Light Sense (ALS), an IR LED driver and a proximity detector. The development board uses a 3.3V power supply and an I2C interface for this sensor, which is not surface-mounted by default.

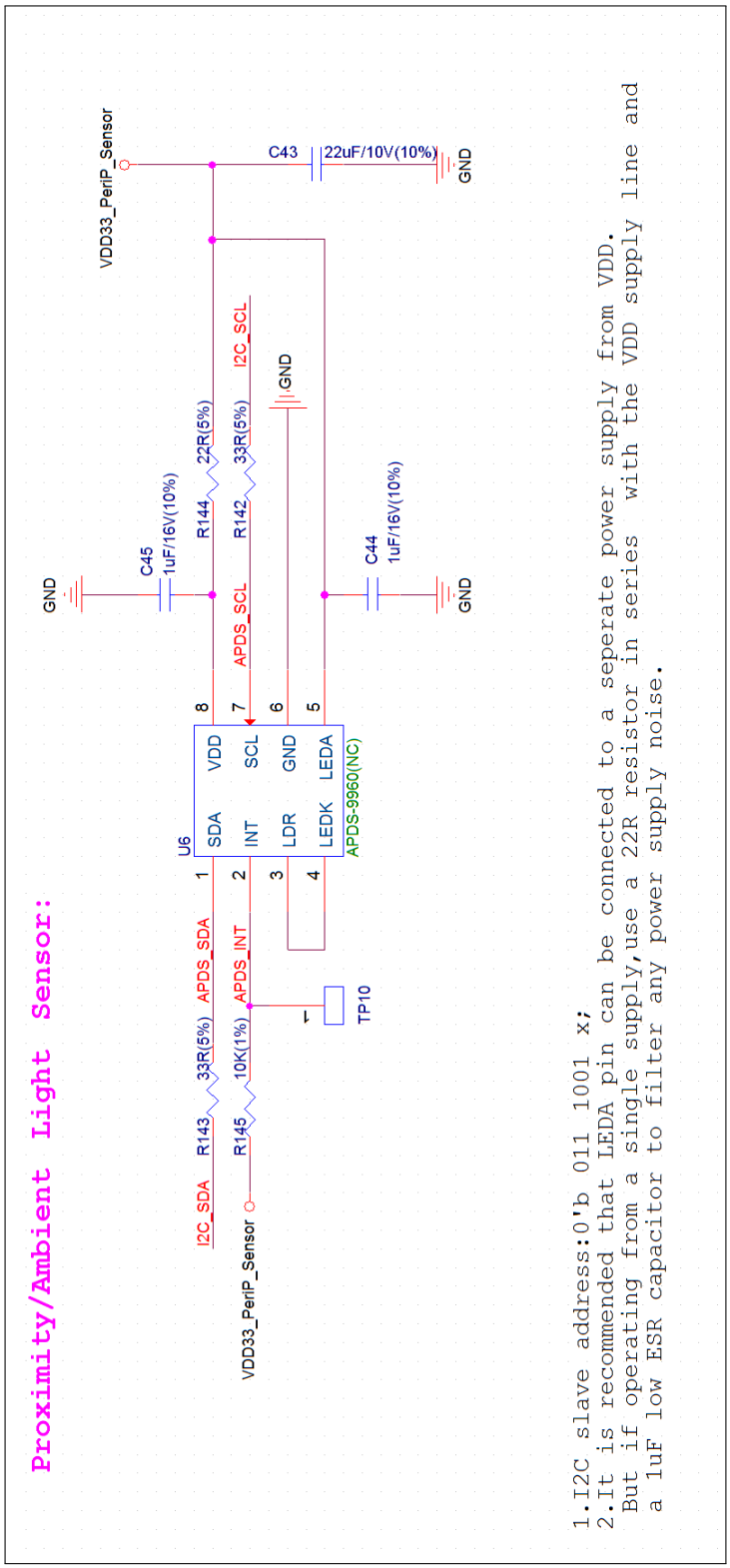

Figure 13: Schematics for Ambient Brightness Sensor

Revision History

Date	Version	Release Notes
2018.06	V1.0	First Release