

FEATURES

- Integrate 15mΩ low Rdson NMOS load switch
- 4-5.5V wide operating voltage range, max voltage 16V
- USB Type-C 3A current advertisement
- Support BC 1.2 DCP & Apple 5V2.4A
- Input UVP & OVP
- Short circuit protection
- Over-temperature protection
- 300μA low operating current
- 3mmx3mm DFNFC-9L package

APPLICATIONS

- USB-C power ports
- AC-DC power adapter

GENERAL DESCRIPTION

HUSB305_A01XX is an ultra-integrated USB PD Source chip, it can be designed as a USB Type-C 5V3A DFP controller with built-in load switch, which can replace the application of LD8200S + external PMOS. There is an ultra-low conduction resistance (15mΩ) N-channel MOSFET integrated. It is available in a 3mm x 3mm, DFNFC-9L package.

DESIGN RESOURCES

HUSB305_A01XX

APPLICATION BLOCK DIAGRAM AND EVB FIGURE

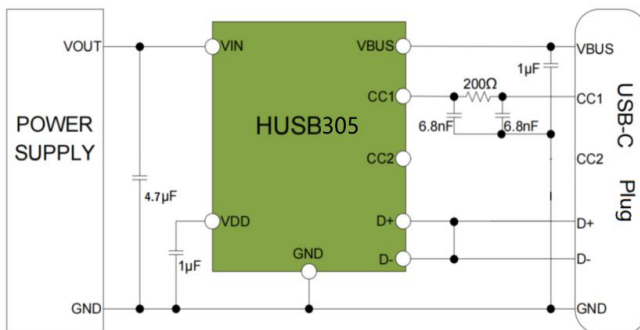


TABLE OF CONTENTS

Features.....	1
Applications.....	1
General Description.....	1
Design Resources.....	1
Application Block Diagram and EVB Figure.....	1
Table of Contents.....	2
Introduction.....	3
Interface Specifications.....	3
Circuit Connection.....	3
Design Overview.....	4
Block Diagram.....	4
Key Products.....	4
Test Result.....	5
Test CONDITION.....	5
Test Equipment.....	5
Test Setting.....	5
Test Process.....	5
Test Waveforms.....	6
Test summary.....	8
Design Documents.....	9
Schematic.....	9
BOM List.....	9
PCB Layout.....	10
Important Notice.....	12

INTRODUCTION

INTERFACE SPECIFICATIONS

There are two interfaces on this evaluation board. The following table describes the functions of each interface.

Table 1. Reference Design Board Interface Specifications

Interfaces	Descriptions
USB Type-C Plug	The Type-C 5V output interface, which can be plugged into the device to supply power.
Vin & GND Pads	There are two pads marked Vin & GND on the back of the PCB as positive and negative input, and the input voltage range is 4V~5.5V.

CIRCUIT CONNECTION

The circuit connection of HUSB305_A01XX paddle card reference design board with the AC-DC power adapter and powered device is shown as below.



Figure 1. Circuit Connection of the HUSB305_A01XX paddle card

DESIGN OVERVIEW

BLOCK DIAGRAM

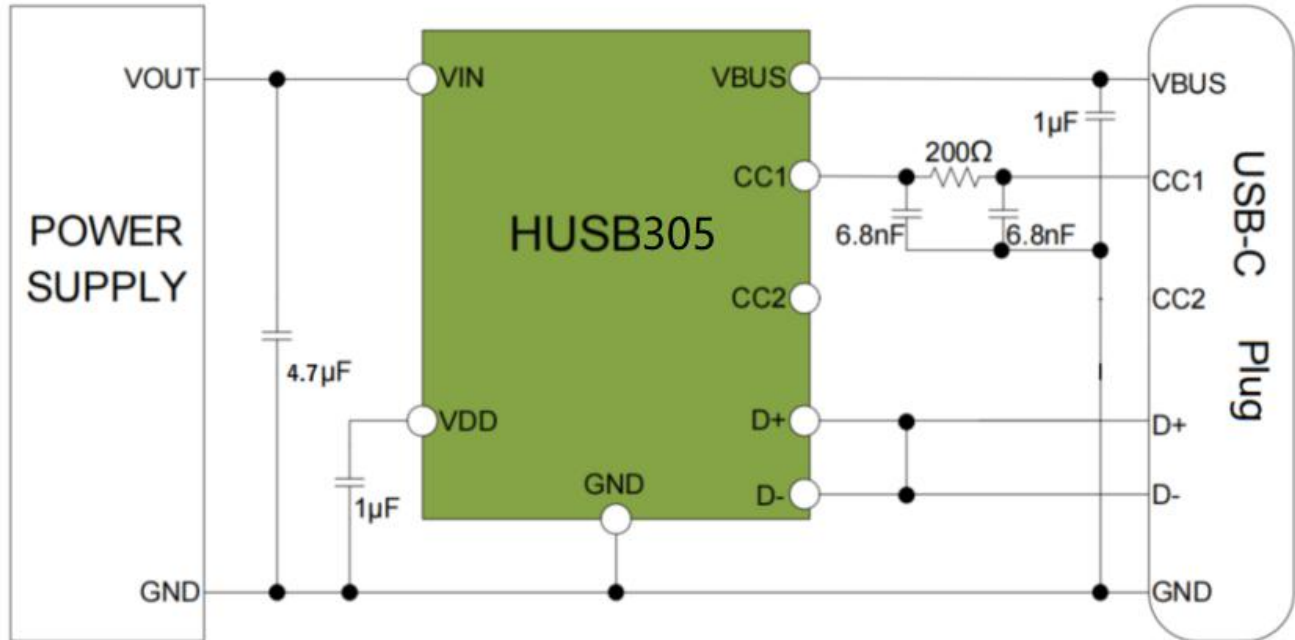


Figure2. RD-2110 Application Block Diagram

KEY PRODUCTS

HUSB305_A01XX – USB Load Switch with USB-C DFP Controller

HUSB305_A01XX is an ultra-integrated USB PD Source chip, it can be designed as a USB Type-C 5V3A DFP controller with built-in load switch, which can replace the application of LD8200S + external PMOS. There is an ultra-low conduction resistance (15mΩ) N-channel MOSFET integrated. It is available in a 3mm x 3mm, DFNFC-9L package.

Key features of HUSB305_A01XX:

- Integrate 15mΩ low Rdson NMOS load switch
- 4-5.5V wide operating voltage range, max voltage 16V
- USB Type-C 3A current advertisement
- Support BC 1.2 DCP & Apple 5V2.4A
- Input UVP & OVP
- Short circuit protection
- Over-temperature protection
- 300µA low operating current
- 3mmx3mm DFNFC-9L package

TEST RESULT

TEST CONDITION

Room temperature test condition. Use HUSB305_A01XX paddle card with 5V3A adapter to do some simple tests, including full load power-on test, capacitive load power-on test, short-circuit load test, dynamic test, etc.

TEST EQUIPMENT

Oscilloscope Tektronix MDO3024, ITECH DC ELECTRONIC LOAD IT8510, 5V3A AC-DC power adapter, multi-meter.

TEST SETTING

Figure 3 shows a complete scene of the test.

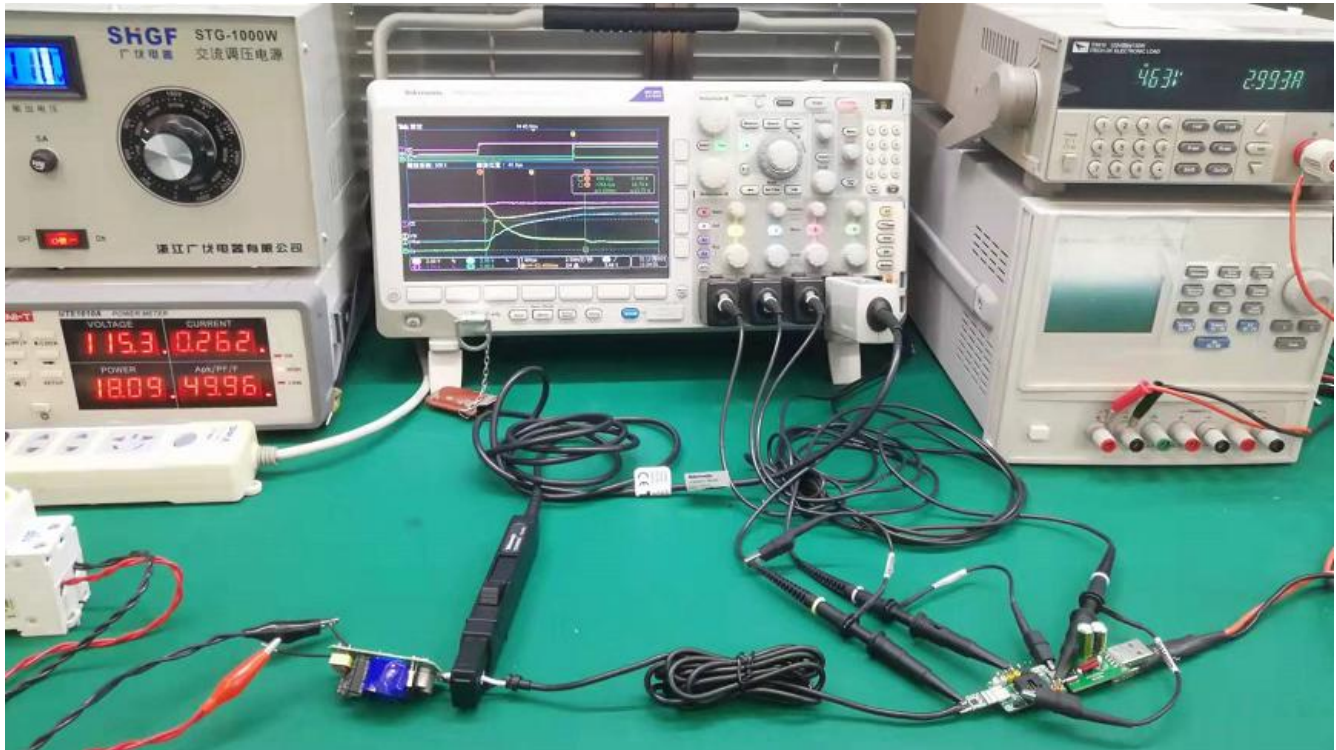


Figure3. the whole picture of the test

TEST PROCESS

1. Connect the 5V3A AC-DC adapter with the HUSB305_A01XX paddle card to the Adapter board with R_d resistance on CC, Connect the positive and negative poles of the electronic load to the V_{bus} and GND of the adapter board, and use an oscilloscope to monitor the waves of the HUSB305_A01XX V_{in}, V_{bus}, CC, and the output current waves of the 5V3A adapter.
2. Power on the 5V3A AC-DC adapter, grab the above waveform as shown figure4 & figure5.
3. Connect a 1000uF electrolytic capacitor on the adapter board V_{bus} & GND, and repeat the above two steps, and the wave as shown figure6.
4. Next step, put off the 1000uF capacitor, power on the 5V3A AC-DC adapter, set the electronic load to short-circuit mode, and then release the short-circuit mode, grab the above waveform as shown figure7 & figure8.
5. Set the electronic load to dynamic load test mode, and set the relevant load parameters, perform the test result of figure9 & figure10 .
6. Use POWER-Z to detect the protocol supported by HUSB305_A01XX Paddle card as shown in Figure 11.

TEST WAVEFORMS

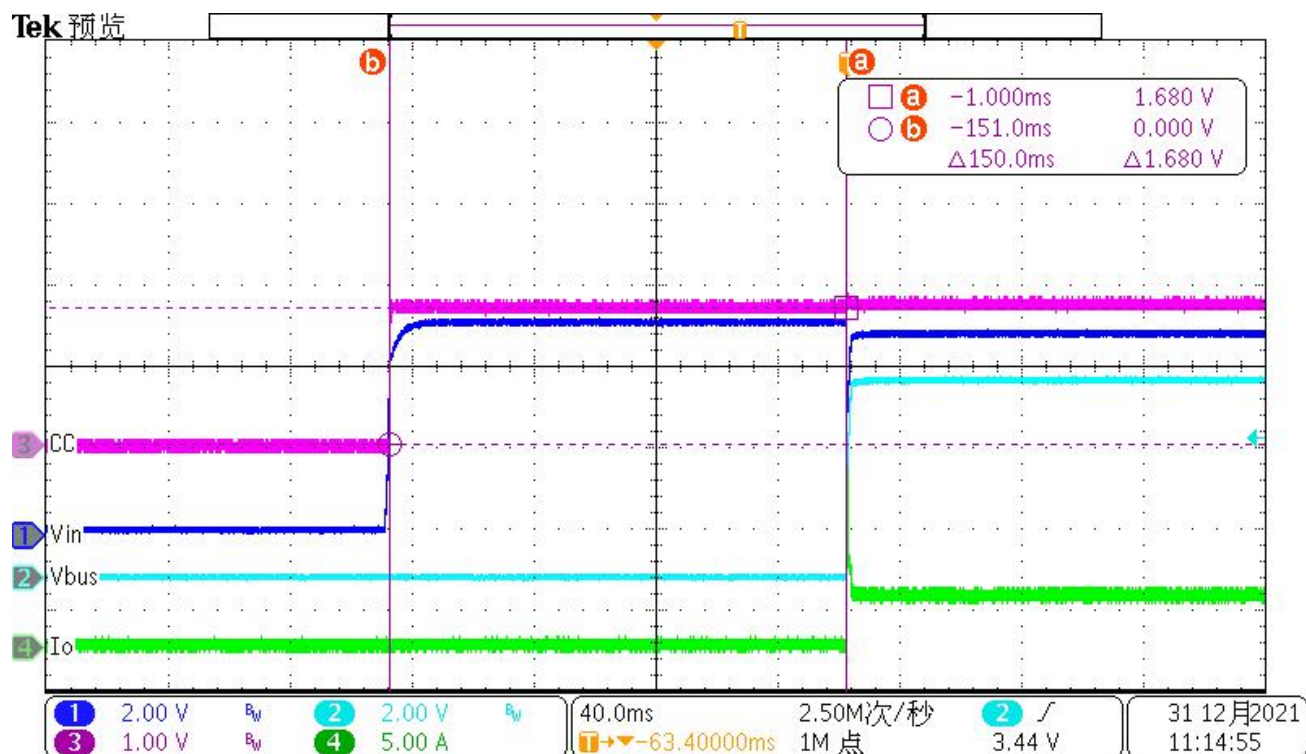


Figure4. full load power-on test wave

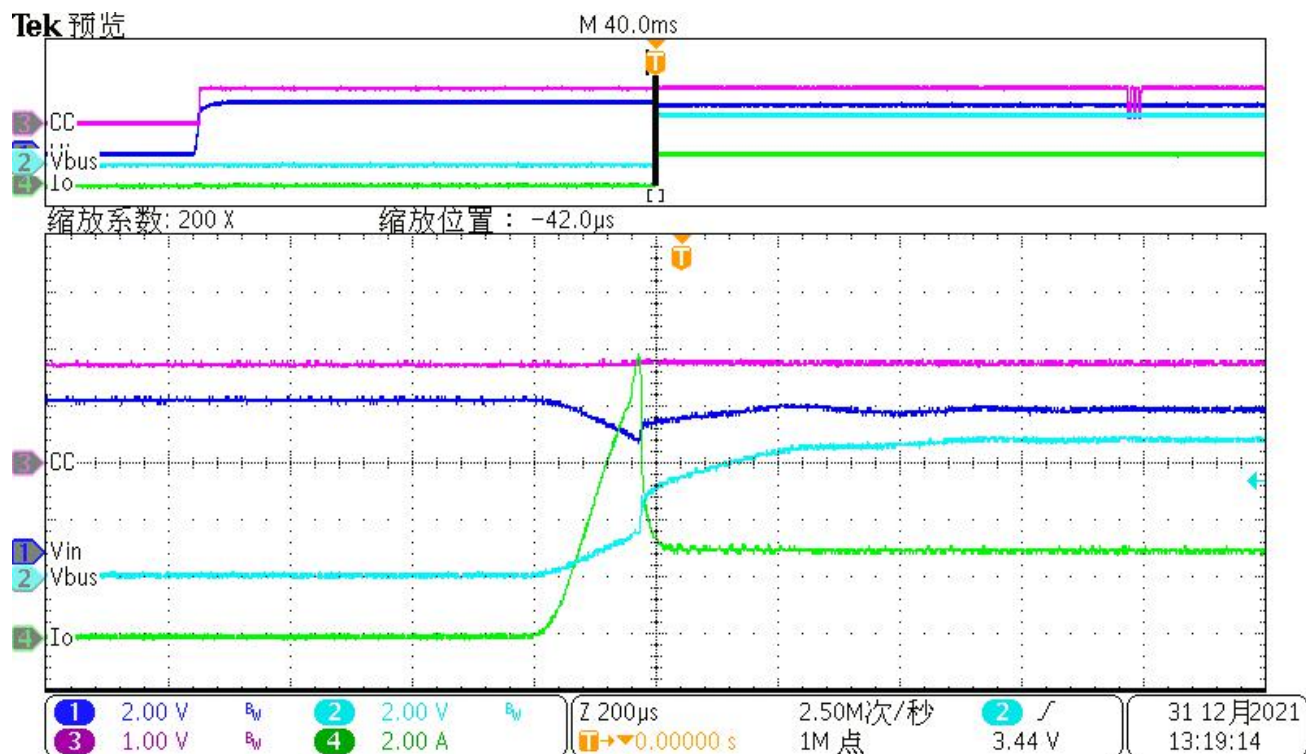


Figure5. the detail wave of full load power-on test

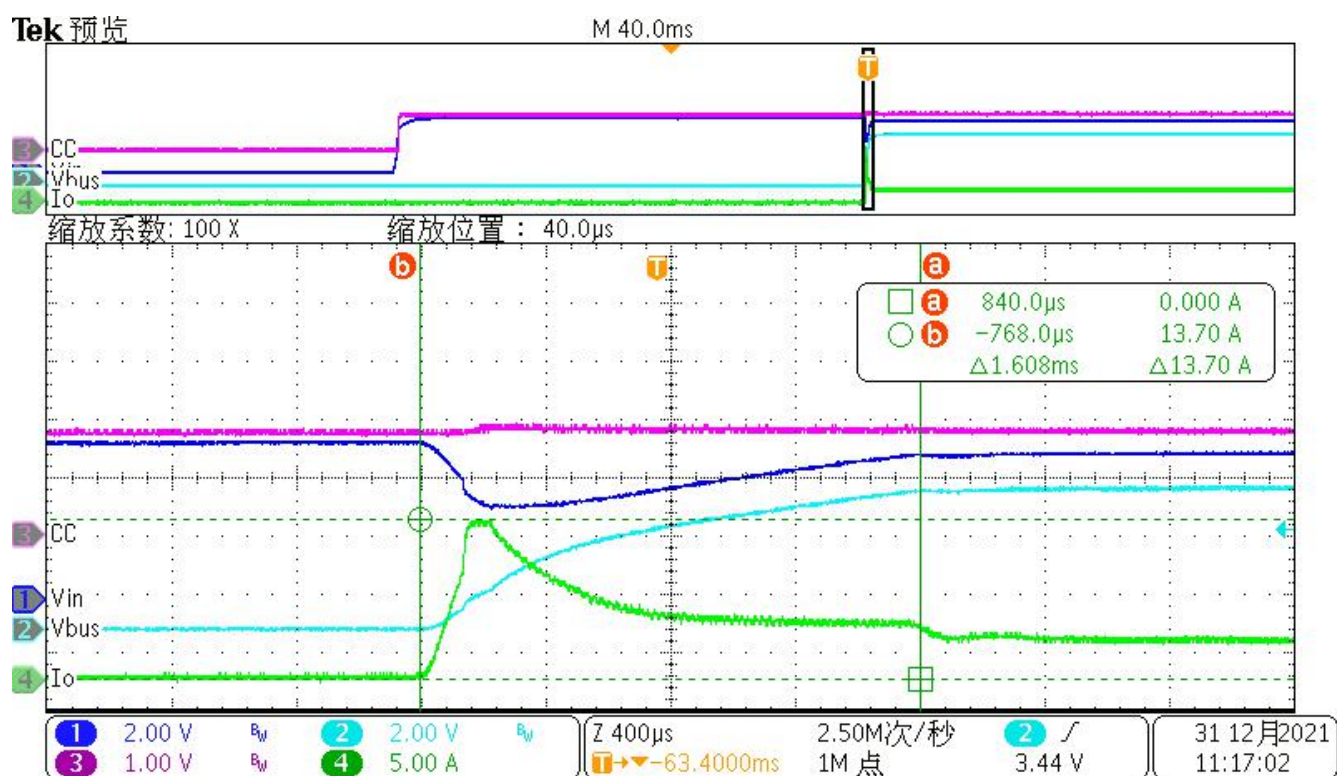


Figure6. the detail wave of 1000uF capacitive load power-on test

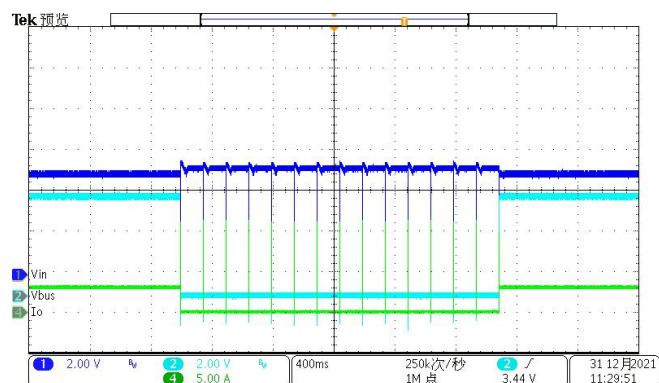


Figure7. short-circuit load test wave

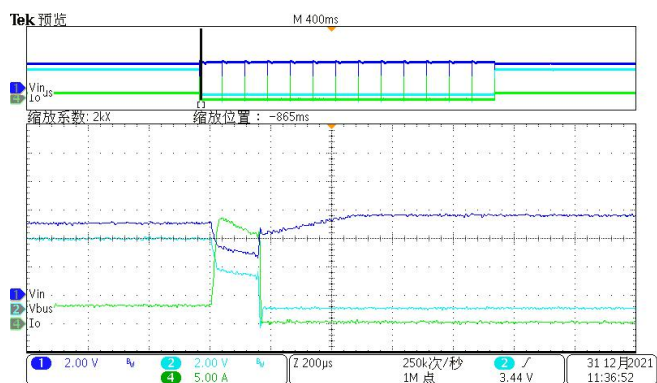


Figure8. the detail wave of the short-circuit load test

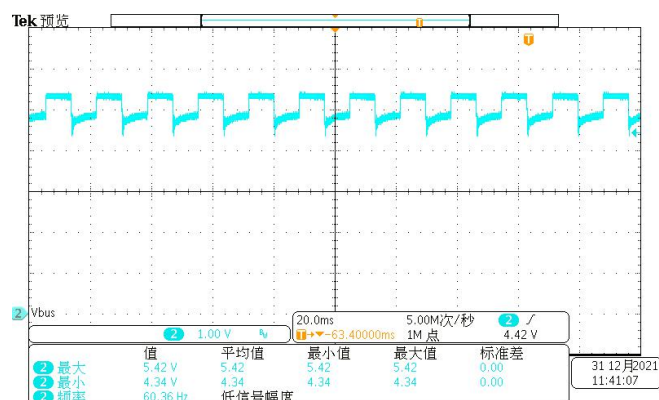


Figure9. 0%~100%-0% load , 60Hz test wave

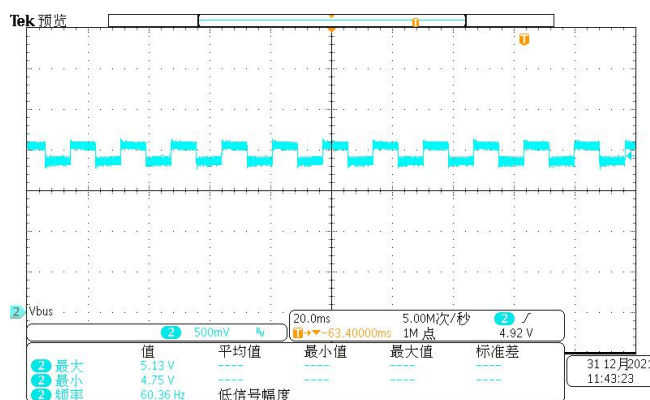


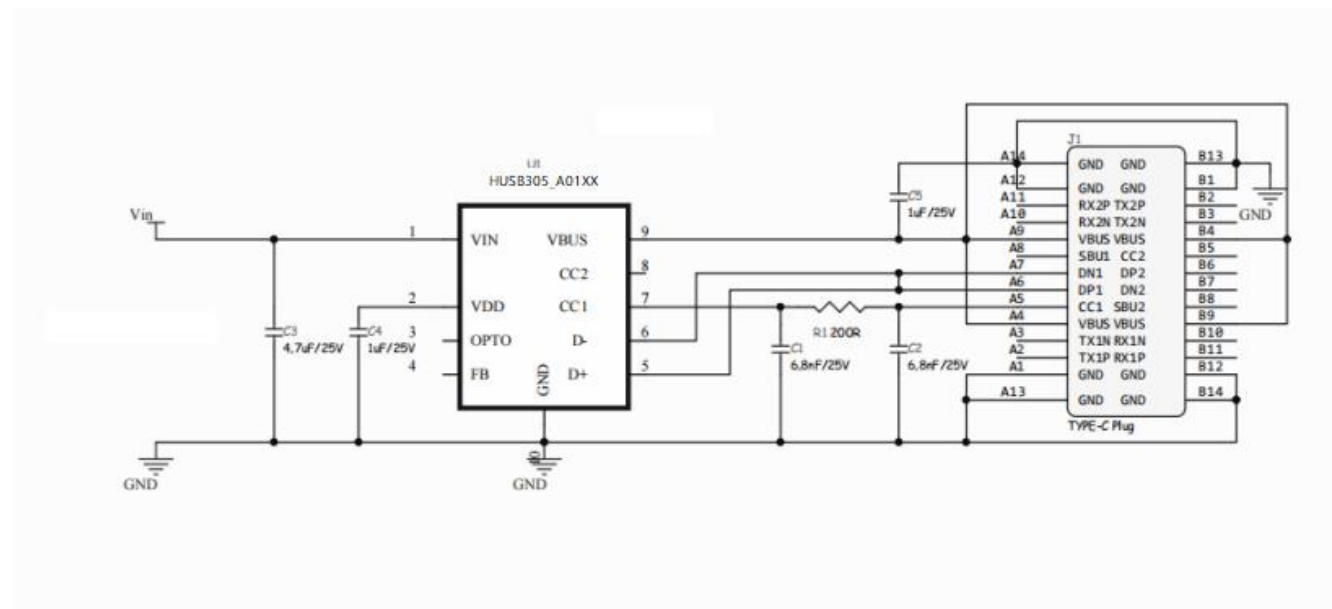
Figure10. 50%~100%-50% load , 60Hz test wave

TEST SUMMARY

The HUSB305_A01XX CC1 and CC2 can support DFP mode 3A current advertising also can be configured with DFP mode. The current advertising is programmed by internal register. The HUSB305_A01XX supports various legacy fast charging protocols including BC1.2 DCP, Apple Divider 3. The HUSB305_A01XX integrates SCP protection function. When the VBUS is hard shorted by fault, the output current increases sharply. When the output current reaches the SCP threshold, the protection circuit takes action and turns off the internal power switch after the SCP de-bounce time. When the short condition is removed, the HUSB305_A01XX is reset to standby mode and will automatic recover again. The HUSB305_A01XX has a good performance in capacitive load startup, has a very good dynamic response, and easily meets the dynamic test requirements. The HUSB305_A01XX is available in a 3mm x 3mm x 0.75mm, DFNFC-9L package, which is very small and thin, is very suitable for the Type-C plug paddle card.

DESIGN DOCUMENTS

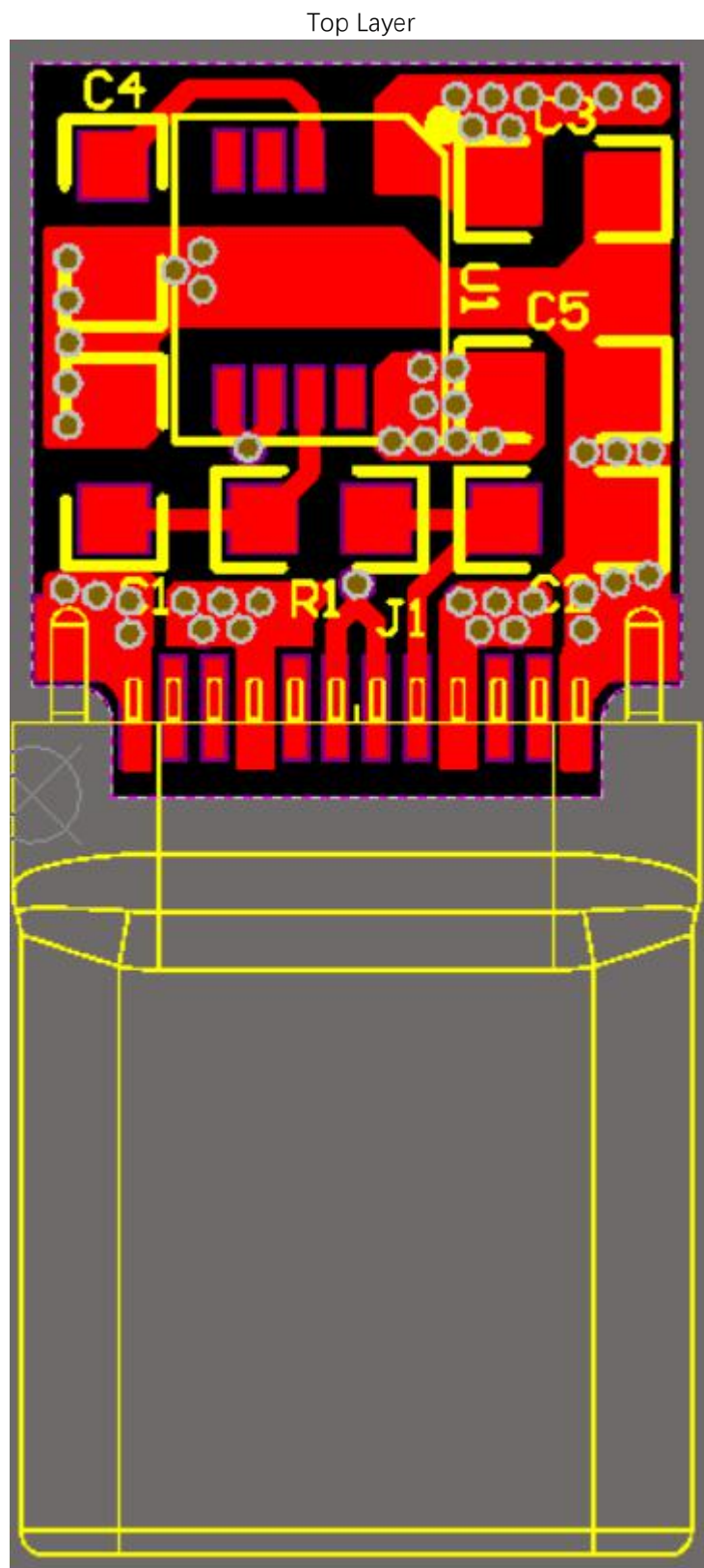
SCHEMATIC



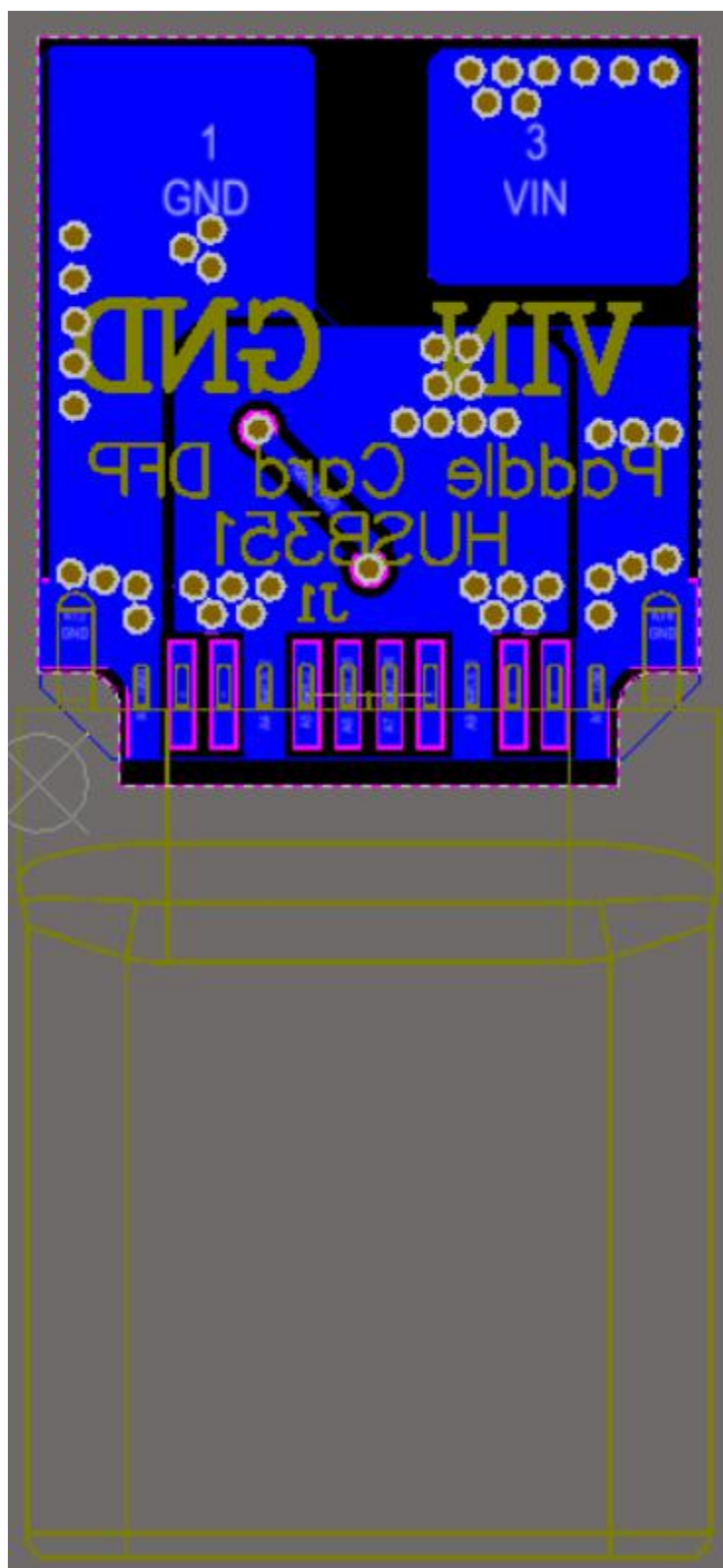
BOM LIST

Reference Design BOM							
No.	Material Name	Specification Description			Item	pcs	Remark
1	Resistor	200Ω	0402	5%	R1	1	
2	capacitor	6.8nF25V	X7R	0402	C1.2	2	
3	capacitor	105K25V	X7R	0402	C5.4	2	
4	capacitor	475K25V	X7R	0402	C3	1	
5	IC	HUSB305_A01XX-DFN3x3-9L			U1	1	
6	Connector	USB Type-C Plug			J1	1	

PCB LAYOUT



Bottom Layer



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