



User Guide

UG000369

CCS801

Standard Board

CCS801-DF_EK_ST

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Content Guide

1	Introduction.....	3	4.1	Schematic	10
1.1	Kit Content.....	3	4.2	Assembly Drawing	11
1.2	Ordering Information	3	4.3	BOM	12
2	Hardware Description.....	4	5	Handling Precautions.....	13
2.1	Hardware Architecture	4	6	Summary	14
2.2	Power Supply	6	7	Revision Information.....	15
2.3	Key Elements	6	8	Legal Information	16
2.4	Board Interface and Test Points	6			
3	Firmware Update	9			
4	Schematic, Assembly Drawing and BOM	10			

1 Introduction

The document provides an overview of the CCS801 development board V4 and covers the following items: hardware description, firmware update, schematics, PCB layout, assembly drawing, bill of materials (BOM) and handling precautions.

1.1 Kit Content

- CCS801 development board V4: 1PCS
- 3V3 USB to I²C board (USB-I²C dongle): 1PCS

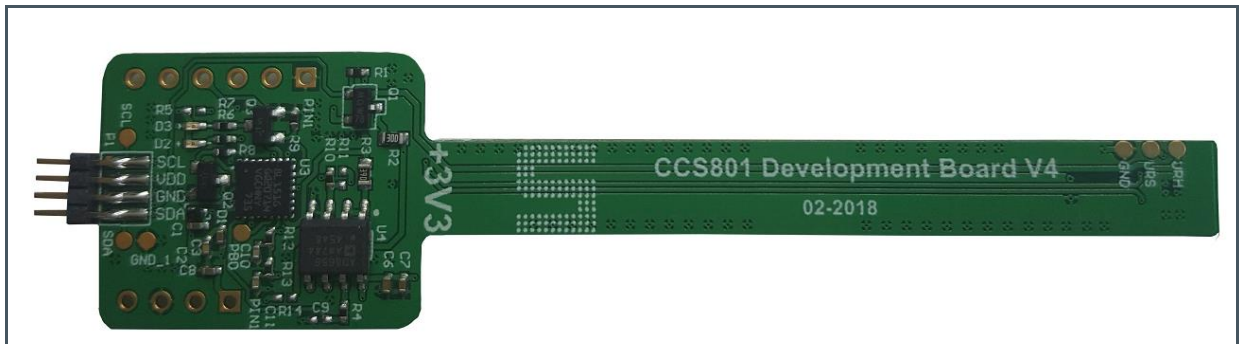
1.2 Ordering Information

Ordering Code	Description
CCS801-DF_EK_ST	CCS801 Standard Board

2 Hardware Description

The CCS801 development board V4, as shown in Figure 1, is an evaluation platform for the CCS801 ultra-low power analog VOC sensor. The board interface is compatible with the USB to I²C board (USB-I²C dongle).

Figure 1:
CCS801 Development Board V4



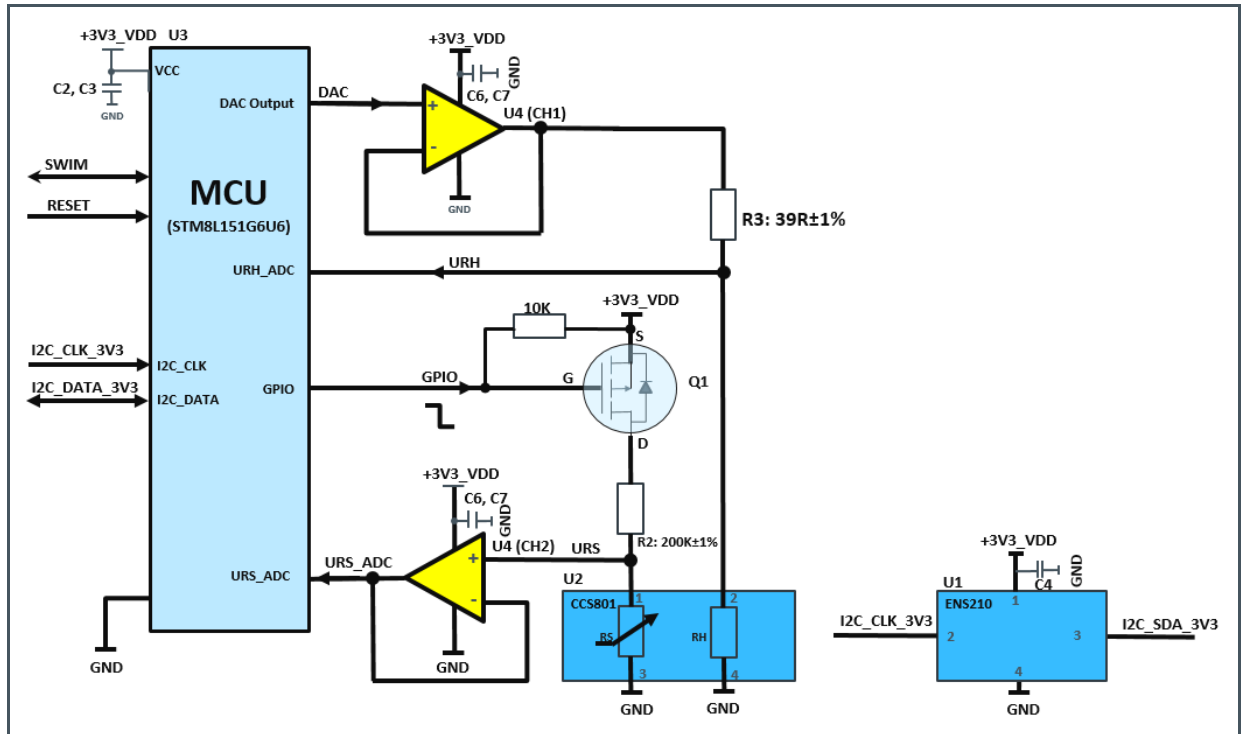
The CCS801 development board V4 has the following key features:

- CCS801 ultra-low power analog VOC sensor for monitoring indoor air quality
- ENS210 relative humidity and temperature sensor with I²C interface used to monitor and compensate the gas reading for environment changes
- Small dimension (81.61 mm in length × 20.57 mm in width).
- Board interface with power (VDD, GND) and I²C signal (SCL, SDA).
- URH, URS, SCL, SDA, GND test points are available on board for the CCS801 pins Heater+, Sensor+ and I²C bus respectively.
- Supports standard I²C mode (100kHz) and fast I²C mode (400kHz)
- Board supports +3.3V VDD power supply.

2.1 Hardware Architecture

The CCS801 development board V4 block diagram is shown in Figure 2.

Figure 2:
CCS801 Development Board V4 Block Diagram



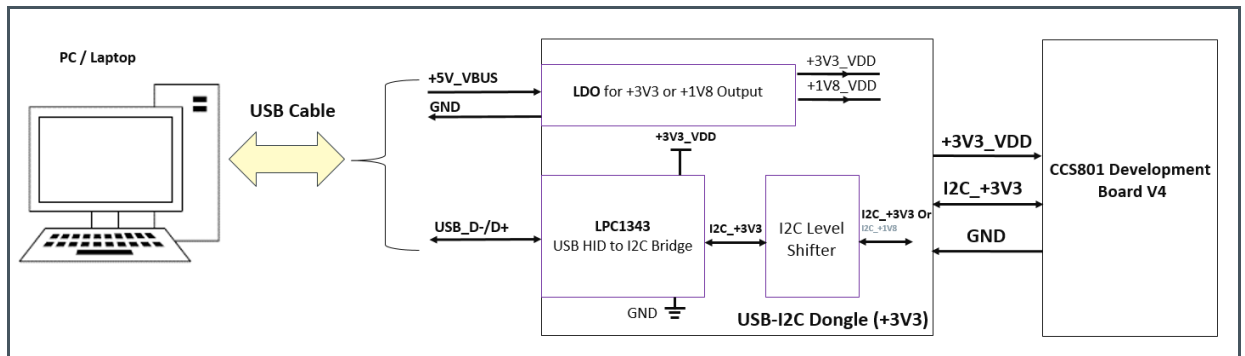
It contains the CCS801 analog VOC gas sensor (U2) with an ENS210 relative humidity and temperature sensor (U1). Heater driver circuit U4 (CH1), sensitive layer acquisition circuit including U4 (CH2) and Q1, 8-bit microcontroller U3 (STM8) and interfaces are included. The ENS210 is directly connected to the I²C bus. Relative humidity and temperature data from ENS210 can be read on the I²C bus and this information can be written to CCS801 to compensate for temperature and humidity changes for indoor air quality monitoring. The on board I²C is compatible with USB-I²C dongle, which can be directly connected to the USB port of any PC / Laptop. For more details about the heater driver circuit and sensitive layer acquisition circuit, please refer to Application Note AN000539 (CCS801 Closed-Loop Hardware Design Guideline). For more details for USB-I²C dongle, please refer to the below link, <https://ams.com/usbi2c>.

SWIM interface on board is used as factory programming and testing purpose.

Please note that there are two versions of USB-I²C dongles, which are VDD output with 3V3 VDD or 1V8 VDD. For CCS801 development board V4, it only uses USB-I²C dongles with 3V3 VDD output.

Figure 3 illustrates the block diagram of the end-to-end connection between the PC via USB-I²C dongle for CCS801 development board V4.

Figure 3:
Block Diagram of End-to-End Connection



2.2 Power Supply

The 3V3 VDD of CCS801 development board V4 is derived from USB-I²C dongle. And the 3V3 VDD of USB-I²C dongle is derived from VBUS (5V) of USB2.0 port by a 3V3 LDO. Refer to Figure 3.

2.3 Key Elements

The CCS801 development board V4 includes the **ams** humidity/temperature sensor ENS210 (U1), the **ams** CCS801 ultra-low power analog VOC sensor (U2), an 8 bits STM8L151G6U6 (U3) MCU and Analog Devices AD8656 (U4) OP AMP. Please refer to Application Note AN000363_3-00 (Design Guidelines). For PCB layout recommendations for MCU and OP AMP, please refer to the supplier's technical documents individually.

2.4 Board Interface and Test Points

2.4.1 Board Interface

The signal net name and pin designators for the board interface are illustrated in Figure 4.

Figure 4:
Board Interface Pinout

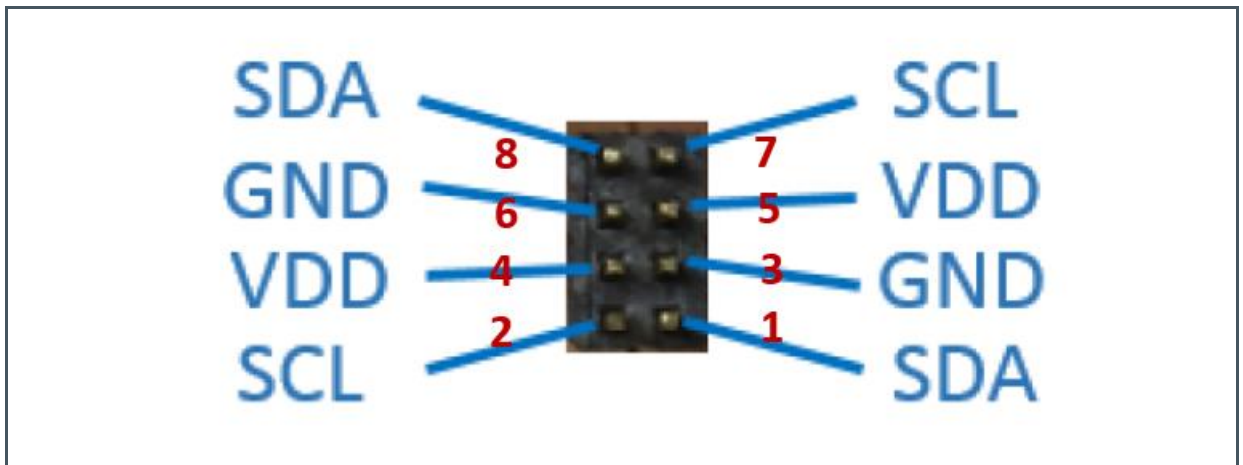


Figure 5:
Pin Description

Pin(s)	Net Name	Description
1	SDA	I ² C Data
3	GND	Power / Signal Ground
5	VDD	3V3 Power Supply
7	SCL	I ² C Clock
2	SCL	I ² C Clock
4	VDD	3V3 Power Supply
6	GND	Power / Signal Ground
8	SDA	I ² C Data

2.4.2 Test Points

There are test points added on the board for I²C (SCL, SDA), sensor+ (URS), heater+ (URH) and for ground (GND). Figure 6 shows different test point locations on the CCS801 development board V4.

Figure 6:
Development Board Test Points



3 Firmware Update

The CCS801 development board V4 contains the released firmware V16.1. In case of updating of firmware is required, please follow the below steps,

- Install Windows PC ENS dashboard application, it is available at <https://ams.com/ensdashboard>
- The ENS Dashboard application setup wizard will be launched and guide you through the installation. For more details, please refer to the above link for ENS Dashboard User Guide.
- Connect CCS801 development board to USB-I²C Dongle as below,



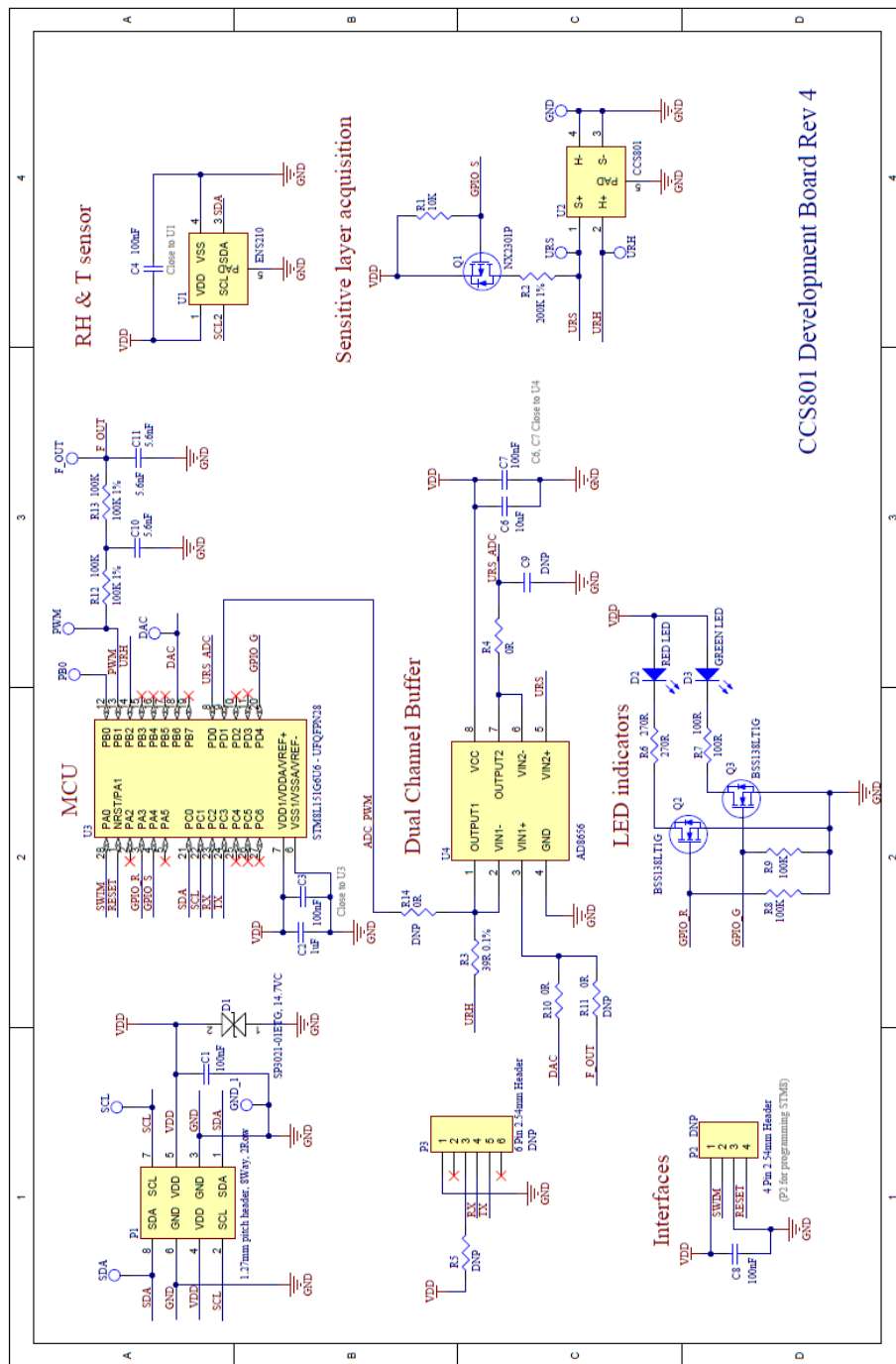
- Connect USB-I²C dongle to Windows PC

Now you can update the application firmware for CCS801 development board V4 through the ENS Dashboard.

4 Schematic, Assembly Drawing and BOM

4.1 Schematic

Figure 7 :
CCS801 Development Board V4



4.2 Assembly Drawing

Figure 8:
Top Layer

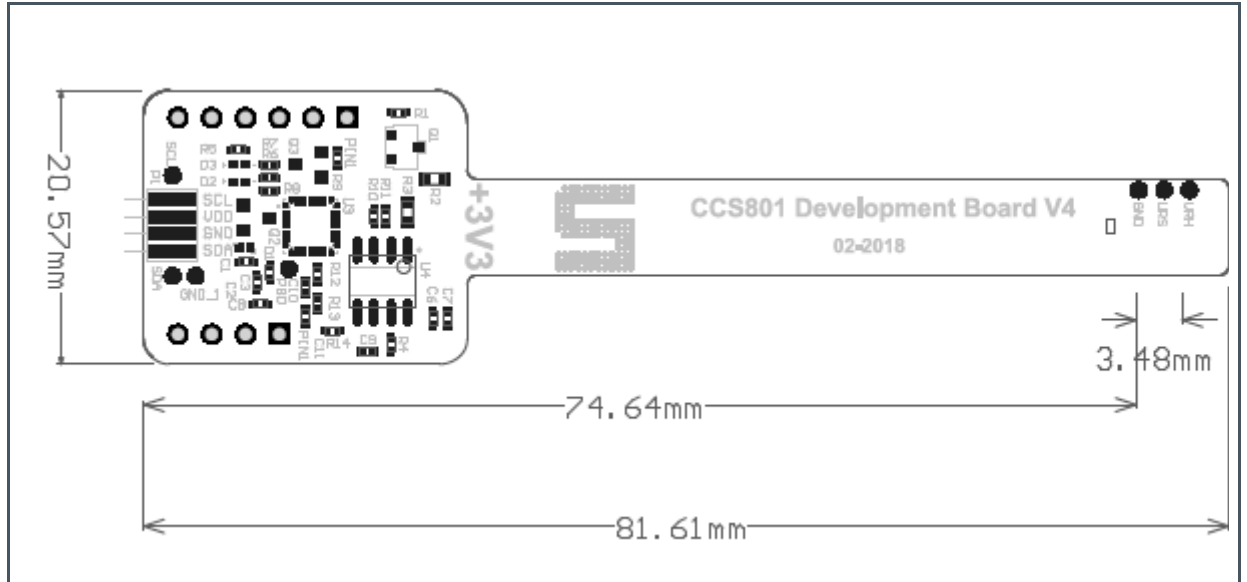
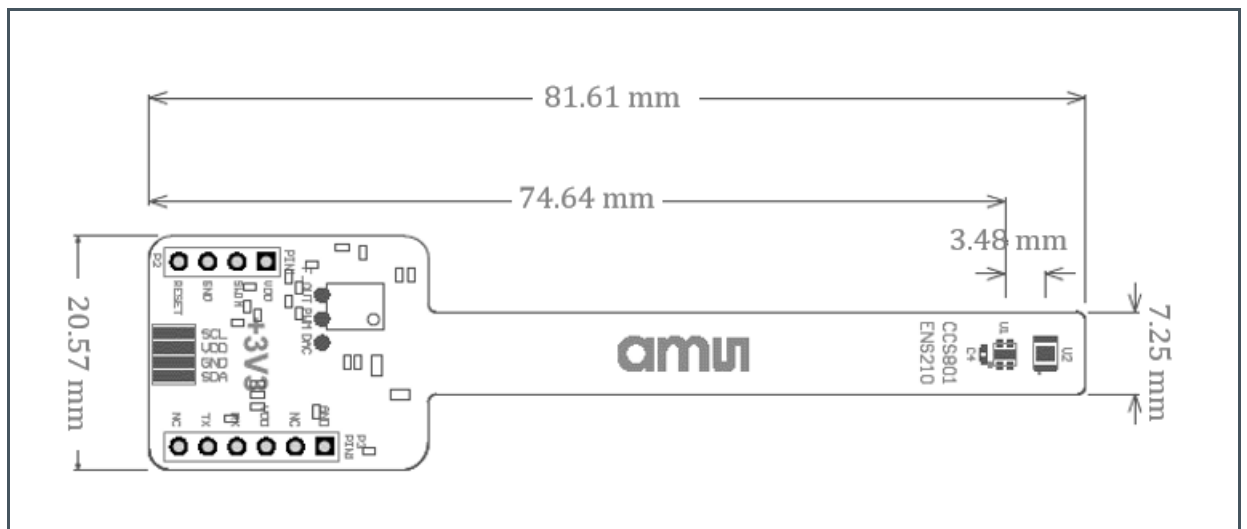


Figure 9:
Bottom Layer



4.3 BOM

The bill of materials (BOM) are shown in Figure 10.

Figure 10:
Bill of Materials

Ref Designator	Quantity (PCS)	Manufacturer	Manufacturer Part Number	Parts Description
U4	1	Analog Devices Inc.	AD8656ARZ-REEL7	IC OPAMP GP 28MHZ RRO 8SOIC
U3	1	ST Micro	STM8L151G6U6	IC MCU 8BIT 32KB FLASH 28UFQFPN
U2	1	ams	CCS801	Gas Sensor
U1	1	ams	ENS210	Humidity and Temp Sensor
R12, R13	2	Yageo	RC0402FR-07100KL	RES SMD 100K OHM 1% 1/16W 0402
R8, R9	2	Yageo	RC0402FR-07100KL	RES SMD 100K OHM 1% 1/16W 0402
R7	1	Yageo	RC0402FR-07100RL	RES SMD 100 OHM 1% 1/16W 0402
R6	1	Yageo	RC0402FR-07270RL	RES SMD 270 OHM 1% 1/16W 0402
R4, R10	2	Yageo	RC0402JR-070RL	RES SMD 0 OHM JUMPER 1/16W 0402
R3	1	TE Connectivity	CPF-A-0603B39RE	RES SMD 39 OHM 0.1% 1/16W 0603
R2	1	Yageo	RC0603FR-07200KL	RES SMD 200K OHM 1% 1/10W 0603
R1	1	Yageo	RC0402JR-0710KL	RES SMD 10K OHM 5% 1/16W 0402
Q2, Q3	2	ON Semiconductor	BSS138LT1G	MOSFET N-CH 50V 200MA SOT-23
Q1	1	NXP	NX2301P,215	MOSFET P-CH 20V 2A TO-236AB
P1	1	GCT(GLOBAL CONNECTOR TECHNOLOGY)	BD030-08-A-A-0200-0300-L-G	1.27mm pitch BOARD-BOARD CONNECTOR HEADER, 8WAY, 2ROW
D3	1	Kingbright	APHHS1005CGCK	LED GREEN CLEAR 0402 SMD
D2	1	Kingbright	APHHS1005SURCK	LED RED CLEAR 0402 SMD
D1	1	Littelfuse	SP3021-01ETG	TVS DIODE 5VWM 14.7VC SOD882
C10, C11	2	Yageo	CC0402KRX7R7BB562	CAP CER 5600PF 16V X7R 0402
C6	1	Murata	GRM155C80J106ME11D	CAP CER 10UF 6.3V X6S 0402
C2	1	Murata	GRM155R61C105KE01D	CAP CER 1UF 16V X5R 0402
C1, C3, C4, C7, C8	5	AVX Corporation	0402ZD104KAT2A	CAP CER 0.1UF 10V X5R 0402

5 Handling Precautions

The CCS801 development board V4 should be handled carefully. Precautions should be taken to prevent ESD from damaging the sensors (CCS801 and ENS210). To prevent damage to sensors, avoid direct contact and avoid contact by sharp object.

6 Summary

This document describes the CCS801 development board V4 about what it is and how to use it from a user point of view.

7 Revision Information

Changes from previous version to current revision v3-00	Page
Initial version 1-00	
Version 2-00: update URL from ams download pages to https://ams.com/usbi2c Or https://ams.com/ensdashboard	Page 5 and 9
Version 3-00: update Content Guide without showing H1 headings,	Page 2
Update Figure 7: CCS801 Development Board V4	Page 10
Update Figure 9: Bottom Layer	Page 11

- Page and figure numbers for the previous version may differ from page and figure numbers in the current revision.
- Correction of typographical errors is not explicitly mentioned.

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