

65-W ATQ GAN USB PD dual-C power charger and adaptor solution demo board (REF_65W_2C_GAN_PAG1) test report

REF_65W_2C_GAN_PAG1

Devices - CYPAP112A3-10SXQ, CYPAS111A1-24LQXQ, CYPD7271-68LQXQ

About this document

Scope and purpose

This document provides test results of the 65-W ATQ GAN USB PD dual-C power charger and adaptor solution demo board (REF_65W_2C_GAN_PAG1). The tests were performed on this board, which is equipped with Infineon CYPAP112A3-10SXQ on primary, CYPAS111A1-24LQXQ on secondary section, and CYPD7271-68LQXQ of the converter.

Intended audience

This document is intended for customers and FAEs using the EZ-PD™ PAG1P/PAG1S+CCG7DC hardware.

Abbreviations and definitions

Table 1 **Abbreviations**

Abbreviations	Description
CC-CV	Constant current - constant voltage
CE	Conducted emission
CH'x'	Oscilloscope channel numbers
DCM	Discontinuous current mode
DP/DM	USB data positive / data negative lines
DUT / EUT	Device under test / equipment under test
FCCM	Forced continuous conduction mode
FET	MOSFET (metal oxide semiconductor field effect transistor)
I_o/I_{OUT}	Output current of the DUT
NGDO	NFET gate driver output
OCP	Overcurrent protection
OVP	Overvoltage protection
P1/P2/3	Port #1/Port #2/Port #3
PAT	Power adaptor tester
PDO	Power delivery output
P-P	Peak-to-peak

65-W ATQ GAN USB PD dual-C power charger and adaptor solution demo board (REF_65W_2C_GAN_PAG1) test report



About this document

Abbreviations	Description
PPS	Programmable power supply
PSM	Pulse skip mode
SCP	Short-circuit protection
SW1	Buck converter switch node
UI	User interface
V_{BUS_C}	Bus voltage at Type-C
V_{BUS_C}/V_{OUT}	Output voltage of the DUT
V_{IN}/V_{IN_DC}	Input DC voltage to the DUT
USB PD	Universal Serial Bus Power Delivery

References

- [1] USB Implementers Forum, Inc.: [Document library](#)
- [2] USB Implementers Forum, Inc.: USB Type-C and connector specification ([Release 2.2](#))
- [3] Infineon Technologies AG: [USB EZ-PD™ Configuration Utility](#)
- [4] Infineon Technologies AG: EZ-PD™ CCG7DC Dual-port USB-C Power Delivery & DC-DC Controller (Document Number: 002-32352)
- [5] Infineon Technologies AG: Hardware design guidelines for EZ-PD™ CCG7XC in multiport charger and adaptor applications (Document Number: 002-37425)
- [6] Infineon Technologies AG: Primary Side Startup Controller, CYPAP112A3 Datasheet (Document Number: 002-25572 Rev. *F), 2022-05-18
- [7] Infineon Technologies AG: USB-PD Power Adapter Secondary Side Controller, CYPAS111 Datasheet (Document Number: 002-27665 Rev. *D), 2022-06-16
- [8] Infineon Technologies AG: EZ-PD™ CCG7D consumer Datasheet, Dual-port USB-C PD controller with integrated Buck-Boost controller, Datasheet (Document Number: 002-32352), 2022-02-14
- [9] Infineon Technologies AG: Power Adaptor System Design Guidelines Using CYPAP11x, Application Note (Rev. *A), 2021-03-22
- [10] Infineon Technologies AG: Design Calculator for PAG1 Designs, Knowledge Base Article (Rev. *A), 2021-12-16
- [11] Infineon Technologies AG: Hardware design guidelines for EZ-PD™ CCG7D consumer - Cigarette lighter adaptor (CLA), User Guide (Rev. **), 2021-09-24

Table of contents

Table of contents

About this document.....	1
Table of contents.....	3
1 Introduction	4
2 Test setup	5
2.1 Device under test (DUT)	5
2.2 DUT setup	5
2.3 Test equipment	6
3 Power management test results	7
3.1 Efficiency 4-pt average	7
3.1.1 Single port 65 W.....	7
3.1.2 Dual port 65 W (Port1 +Port2)	8
3.2 Standby power consumption	10
3.3 Output voltage ripple and noise peak-peak.....	11
3.4 Output voltage dynamic response	15
3.5 Output current dynamic response	17
3.6 Start-up turn-on delay	18
3.7 Start-up turn-on rise time	18
3.8 Shut-down Hold-up and Fall time	19
3.9 Switch voltage stress.....	20
3.10 Overcurrent protection	22
3.11 Short-circuit protection	23
3.12 Overvoltage protection.....	25
3.13 Overtemperature protection	27
3.14 Thermal captures	28
3.15 Conducted emission	32
3.16 Surge test.....	35
3.17 ESD test.....	36
3.18 USB PD source test results (using Quadramax)	37
4 Appendix.....	38
4.1 Schematics	38
4.2 Bill of materials.....	41
4.3 PCB layout	44
4.4 Transformer specifications (T1 ATQ23.7 DMR96 350 μ H)	46
4.5 Common mode choke specifications (LF1 600 μ H, LF2 8 mH)	47
4.6 Pulse transformer (T2)	48
4.7 EZ-PD™ Configuration Utility	50
Revision history.....	53
Disclaimer.....	54

Introduction

1 Introduction

Infineon's CYPAP112A3 part of EZ-PD™ PAG1P family is designed for a secondary controlled AC/DC flyback converter topology. In this topology, the voltage and current regulation is performed by the secondary controller. CYPAP112A3 is responsible for providing the start-up function, driving the primary side FET as well as responding to fault conditions.

Infineon's CYPAS111A1 part of EZ-PD™ PAG1S family is an integrated secondary-side synchronous flyback controller, synchronous rectifier (SR) controller, and charging port controller. CYPAS111A1 is designed to fit a secondary-controlled flyback system with a primary startup controller (CYPAP112A3) with secondary-side sensing and regulation. CYPAS111A1 is targeted towards mobile power adapters. It fits well into high-efficiency AC-DC flyback designs for USB Power Delivery, Qualcomm Quick Charge, and other standard charging protocols. CYPAS111A1 also supports the USB Power Delivery (USB PD 3.0) Programmable Power Supply (PPS) mode.

The interface between CYPAP112A3 and CYPAS111A1 is through a pulse edge transformer and its associated circuitry. EZ-PD™ CCG7DC is highly integrated with 2 PD controllers + 2 DC-DC controllers + 1 MCU; all integrated in one single chip thereby enabling the customers to build high power density charger designs. CCG7DC is integrated with Arm® Cortex®-M0 and 128-KB Flash that allows to implement custom features and build competitive end products, as well as upgrade the firmware on the field for events such as PD spec update or post production issue fixes. CCG7DC makes the customer end product competitive and secure by supporting features, such as dynamic load sharing, signed field firmware upgrade, and variable buck input voltage.

This document contains test results of PAG1+CCG7DC based 65-W ATQ GAN dual-C power adapter solution board. The tests were performed on this board, which is equipped with Infineon's CYPAP112A3-10SXQ on primary, CYPAS111A1-24LQXQ on secondary section, and CCG7DC of the converter.

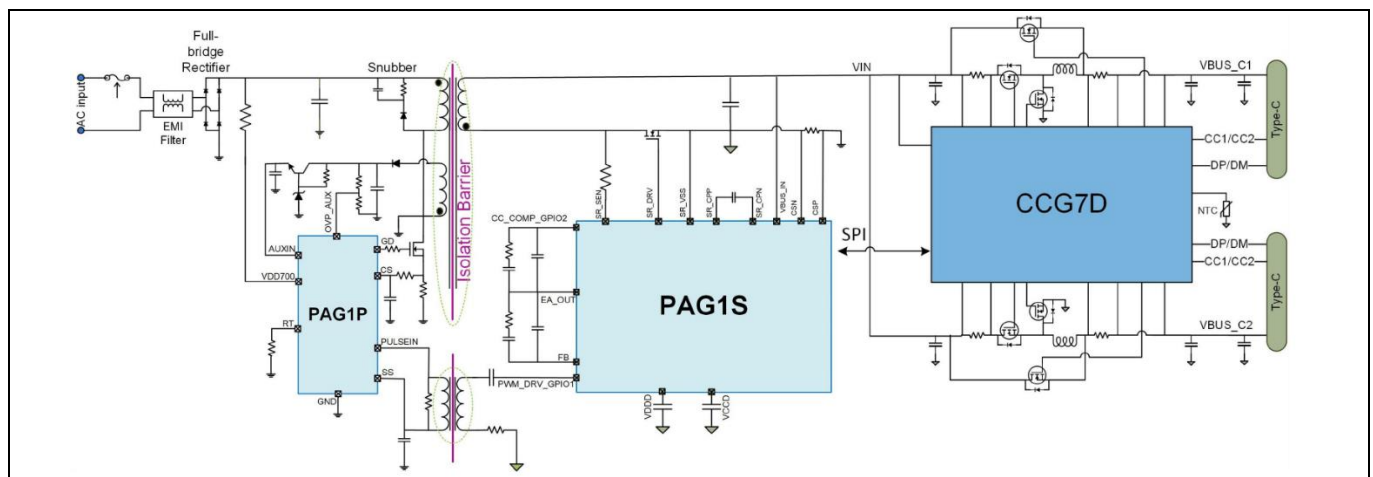


Figure 1 Schematic diagram of EZ-PD™ PAG1x-based 65-W ATQ GAN dual-C solution design

65-W ATQ GAN USB PD dual-C power charger and adaptor solution demo board (REF_65W_2C_GAN_PAG1) test report

Test setup

2 Test setup

2.1 Device under test (DUT)

65-W ATQ GAN dual-C EZ-PD™ PAG1P/PAG1S+CCG7DC solution demo: (CYPAP112A3/CYPAS111A1+CYPD7271)

Table 2 EZ-PD™ PAG1P/PAG1S+CCG7DC solution kit details

DUT contents	Description
CYPAP112A3+CYPAS111A1	Primary and secondary controller
CYPD7271	DC-DC and PD controller
Firmware version	CYPAS111-24LQXQ_pa_20230303.hex ATQ_CCG7D_20230315.hex

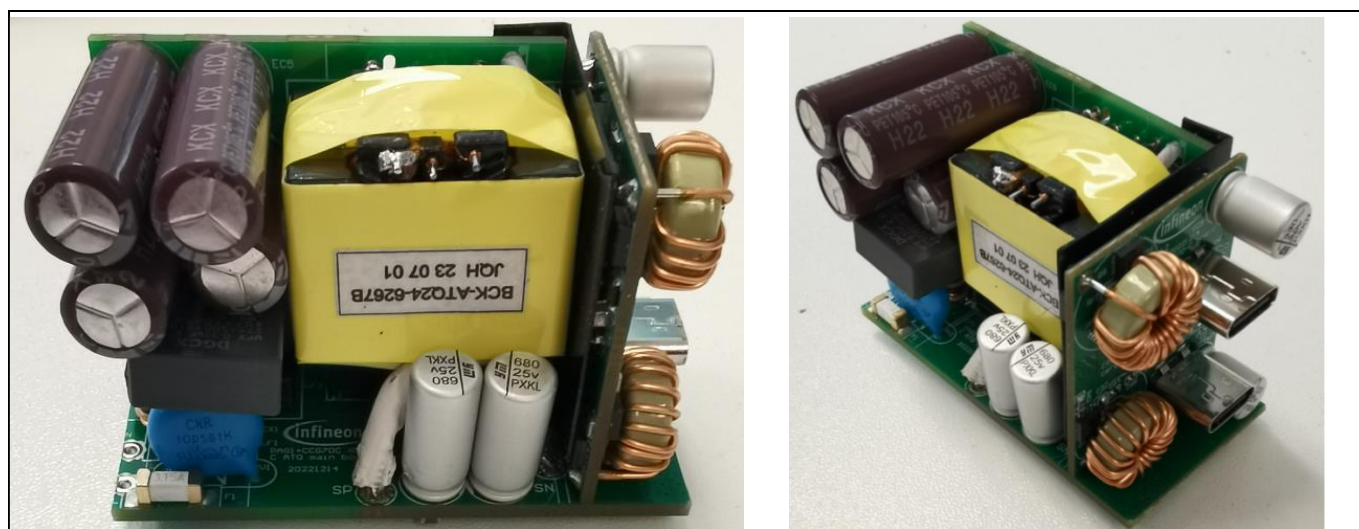


Figure 2 PCB dimensions (mm): 55(L) × 34(W) × 27(H)

Note: All the tests mentioned in this report are carried-out under an open-frame condition.

2.2 DUT setup

65-W ATQ GAN dual-C EZ-PD™ PAG1P/PAG1S+CCG7DC solution demo: (CYPAP112A3/CYPAS111A1+CYPD7271).



Figure 3 Test setup

65-W ATQ GAN USB PD dual-C power charger and adaptor solution demo board (REF_65W_2C_GAN_PAG1) test report



Test setup

The DUT is connected to a PAT Tester (CCPROG PAT) using a USB Type-C cable. After a successful connection, PAT UI does a PDO discovery and displays the same on the UI. The solution kit is pre-configured with 4 PDOs for single port1 or single port2 in the 65-W ATQ GAN dual-C demo board.

- PDO 1: 5 V, 3 A FIXED
- PDO 2: 9 V, 3 A FIXED
- PDO 3: 12 V, 3 A FIXED
- PDO 4: 15 V, 3 A FIXED
- PDO 5: 20 V, 3.25 A FIXED
- PDO 6: 3.3 V to 21 V, 0 A - 3.25 A PPS
- Dual output: Port1+Port2:
 - 20 W: 5 V/3 A, 9V/2.22A, 3.3V-5.9V/3A, 3.3V-11V/2.2A
 - 32.5W: 5V/3A, 9V/3A, 12V/2.7A, 3.3V-11V/3A, 3.3V-16V/2.15A
 - 45W: 5V/3A, 9V/3A, 12V/3A, 15V/3A, 20V/2.25A, 3.3V-16V/3A

One can either choose the suitable pre-configured PDO or configure a new one using Infineon's EZ-PD™ Configuration Utility. For the tests in the following sections, we use the pre-configured PDOs.

For more details on PAT Tester and UI, see [USBCEE product details](#) webpage.

Type C-C cable (1-meter long) used: Type C-C cable being used for all the tests mentioned in this report is [3027003-01M](#).

2.3 Test equipment

[Table 3](#) lists the test equipment used to measure the efficiency, ripple, regulation, and transient response.

Table 3 Test equipment list

Test setup	Description
Oscilloscope	Tektronix MDO3024
Power meter	Yokogawa WT310E
Digital multimeter (Vo and Io)	FLUKE 17B
Programmable AC source	JingCe DAL15P
Electronic load	Chroma 63600-1
Thermal camera	Fluke Ti200
Automation software	Chroma 8000
EMI Test Receiver 9k-300MHz	KeHuan KH3932
QuadraMax	QuadraMax 103 1.4.4

Power management test results

3 Power management test results

Note: All the tests mentioned in this report are carried-out under an open-frame condition. The results documented here are based on the test reports of the 65-W ATQ GAN dual-C power charger and adaptor solution demo board.

3.1 Efficiency 4-pt average

3.1.1 Single port 65 W

Table 4 Efficiency results

Parameter	Test condition	Min criteria	Unit	Test result	
		DoE level 6		115Vac – 60 Hz	230Vac – 50 Hz
Four-point average efficiency (Average of 25%, 50%, 75%, and 100% load)	Vo = 3.3Vdc, Io = 3 A	78.63%	%	86.37	82.1
	Vo = 5Vdc, Io = 3 A	81.39%	%	90.07	86.9
	Vo = 9Vdc, Io = 3 A	86.62%	%	91.81	90.23
	Vo = 12Vdc, Io = 3 A	87.40%	%	91.84	90.92
	Vo = 15Vdc, Io = 3 A	87.73%	%	91.8	91.75
	Vo = 20Vdc, Io = 3.25 A	88.00%	%	92.01	92.33
No load consumption	No USB sink attached	210 max	mW	37	51

- Peak efficiency: 93.15% (at 230Vac – 50 Hz, 20 V – 3.25 A)

Note:

1. Vout for efficiency calculations is measured across Vbus_C at board end.
2. Variation of $\pm 0.3\%$ in 4-point average efficiency and $\pm 1\%$ in 10% efficiency can be observed.

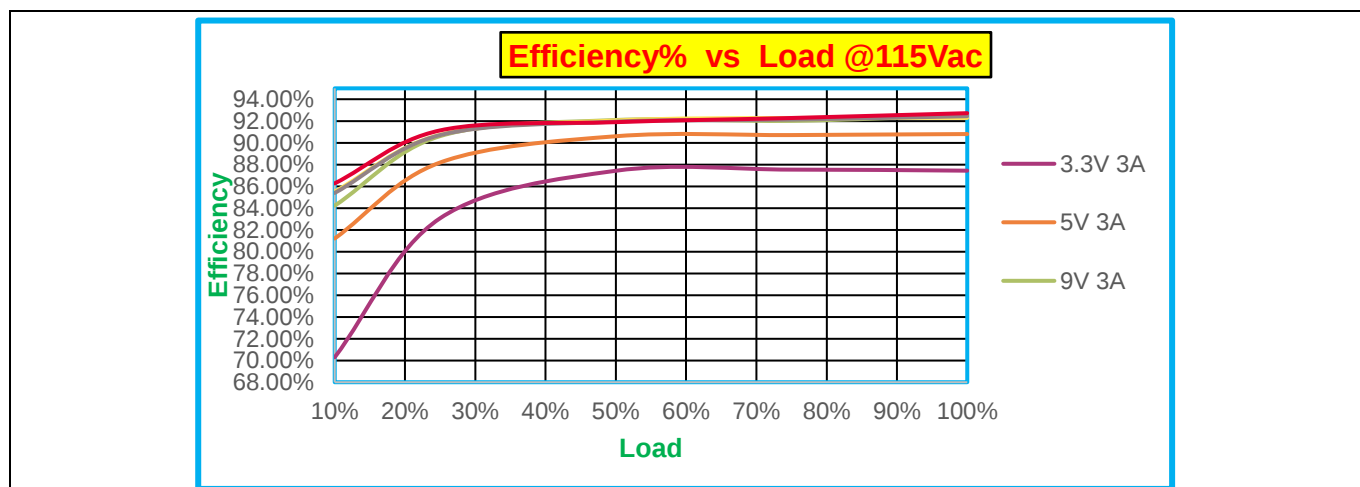


Figure 4 Efficiency at 115Vac, 60 Hz

65-W ATQ GAN USB PD dual-C power charger and adaptor solution demo board (REF_65W_2C_GAN_PAG1) test report

Power management test results

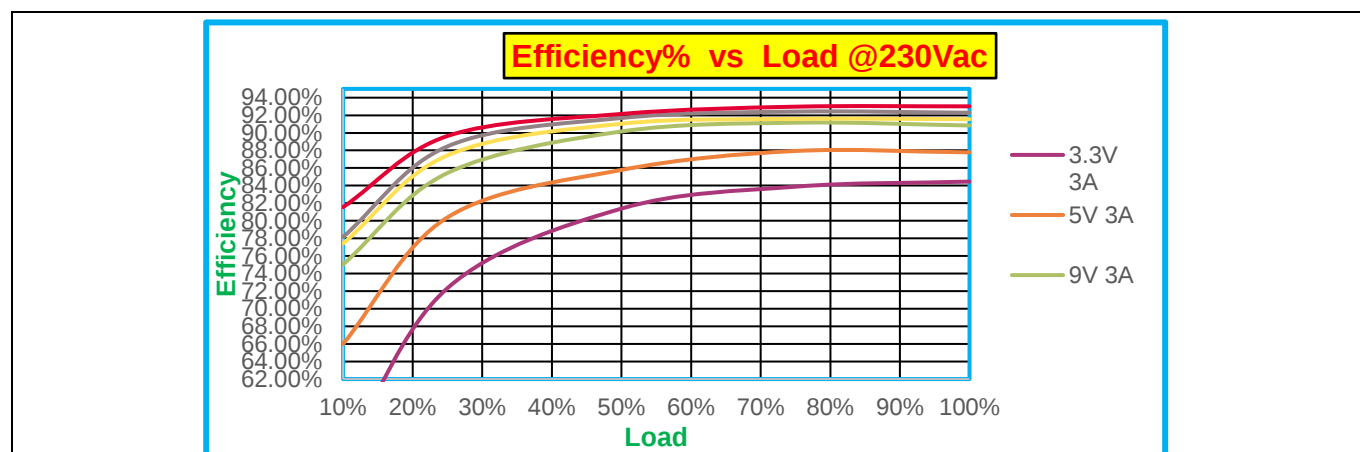


Figure 5 Efficiency at 230Vac, 50 Hz

3.1.2 Dual port 65 W (Port1 +Port2)

Table 5 Efficiency results

Parameter	Test condition	Min criteria	Unit	Test result	
		DoE level 6		115Vac 60Hz	230Vac 50Hz
Four- point Average Efficiency (Average of 25%, 50%, 75%, 100% load)	Port1 5 V, 3 A Port2 5 V, 3 A	81.609%	%	89.424	88.3
	Port1 5 V, 3 A Port2 9 V, 3 A	84.1325%	%	89.744	89.741
	Port1 5 V 3 A Port2 12 V, 3 A	86%	%	90.57	90.407
	Port1 5 V, 3 A Port2 15 V, 3 A	86%	%	90.418	90.416
	Port1 5 V, 3 A Port2 20 V, 2.25 A	86%	%	90.637	91.195
	Port1 9 V, 3 A Port2 12 V, 3 A	86%	%	90.692	90.902
	Port1 12 V, 2.7 A Port2 12 V, 2.7 A	86%	%	90.92	91.106
	Port1 9 V, 2.22 A Port2 15 V, 3 A	86%	%	90.73	91.009
	Port1 9 V, 2.22 A Port2 20 V, 2.25 A	86%	%	90.748	91.472

Peak Efficiency: **91.472 %** (At 230Vac-50Hz, Port1 9V2.22A+Port2 20V2.25A)

Note:

1. V_{out} for efficiency calculations is measured across V_{bus_C} at board end.
2. Variation of $\pm 0.3\%$ in 4-point average efficiency and $\pm 1\%$ in 10% efficiency can be observed.

65-W ATQ GAN USB PD dual-C power charger and adaptor solution demo board (REF_65W_2C_GAN_PAG1) test report

Power management test results

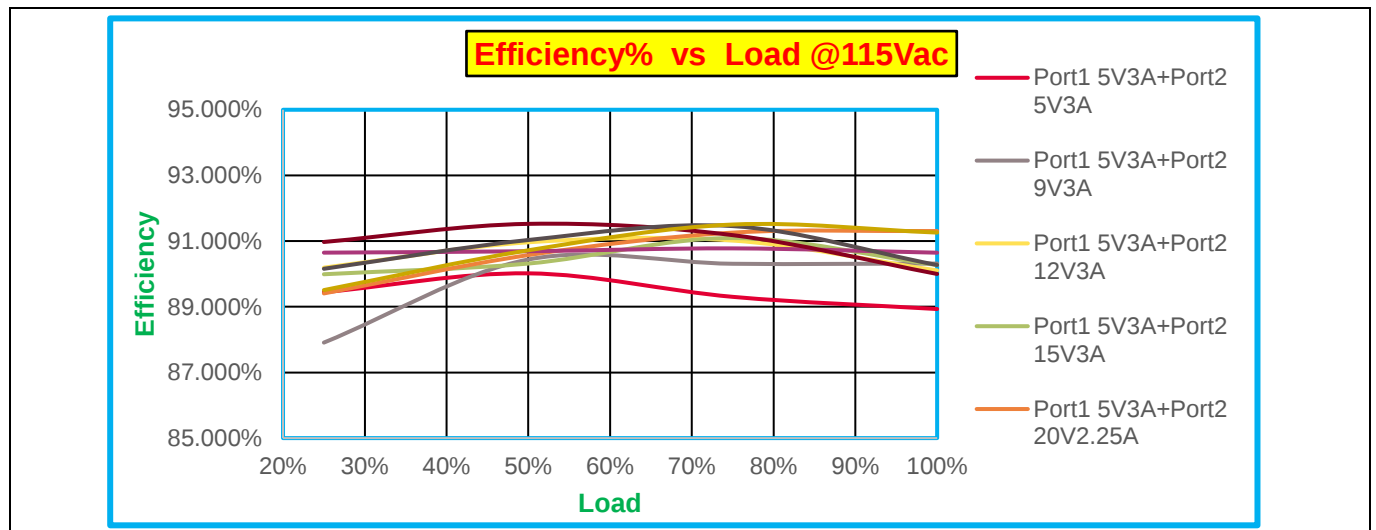


Figure 6 Efficiency at 115Vac, 60 Hz

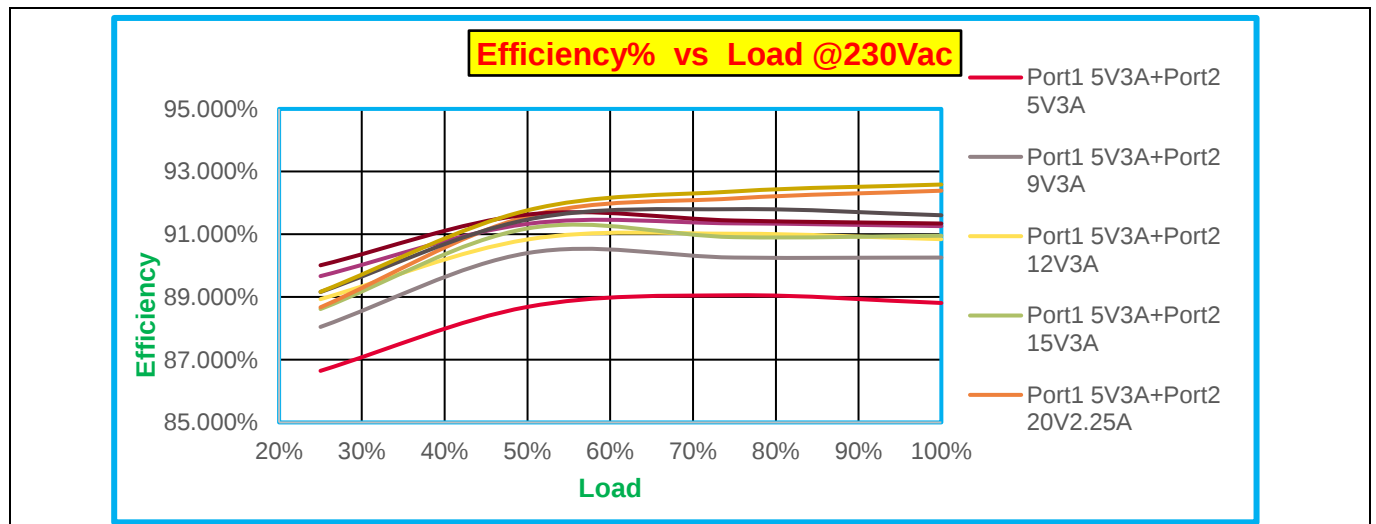


Figure 7 Efficiency at 230Vac, 50 Hz

65-W ATQ GAN USB PD dual-C power charger and adaptor solution demo board (REF_65W_2C_GAN_PAG1) test report

Power management test results

3.2 Standby power consumption

Table 6 Standby power results^[1]

Vin (Vac)	90Vac, 60 Hz	115Vac, 60 Hz	230Vac, 50 Hz	246Vac, 50 Hz
Input power	46	37	51	60

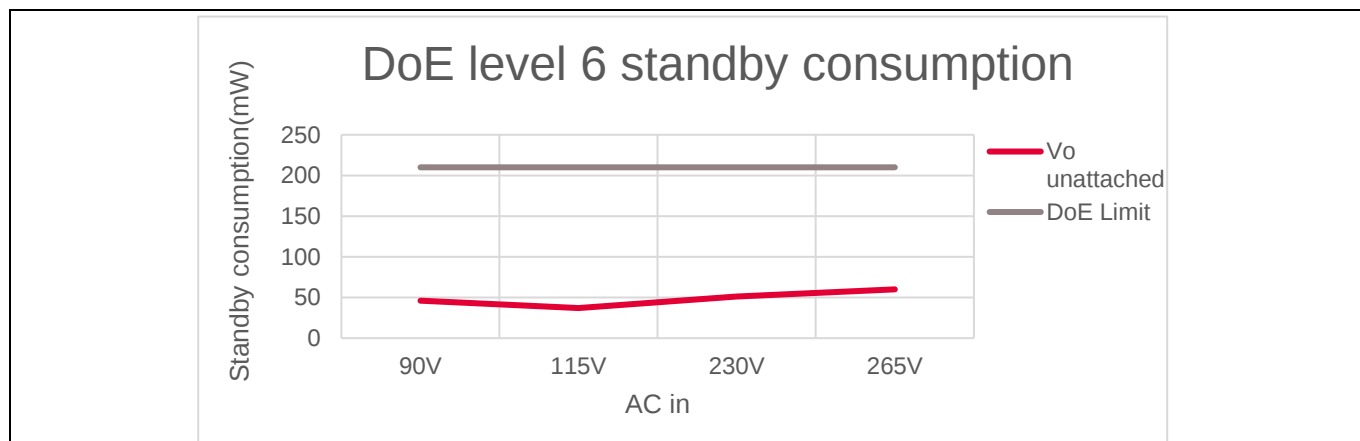


Figure 8 Standby power vs DoE level 6 criteria

Note:

1. There should be 5 minutes of warmup-time before starting to measure standby power.



Figure 9 Detailed power measurement results @115Vac, 60 Hz

65-W ATQ GAN USB PD dual-C power charger and adaptor solution demo board (REF_65W_2C_GAN_PAG1) test report

Power management test results

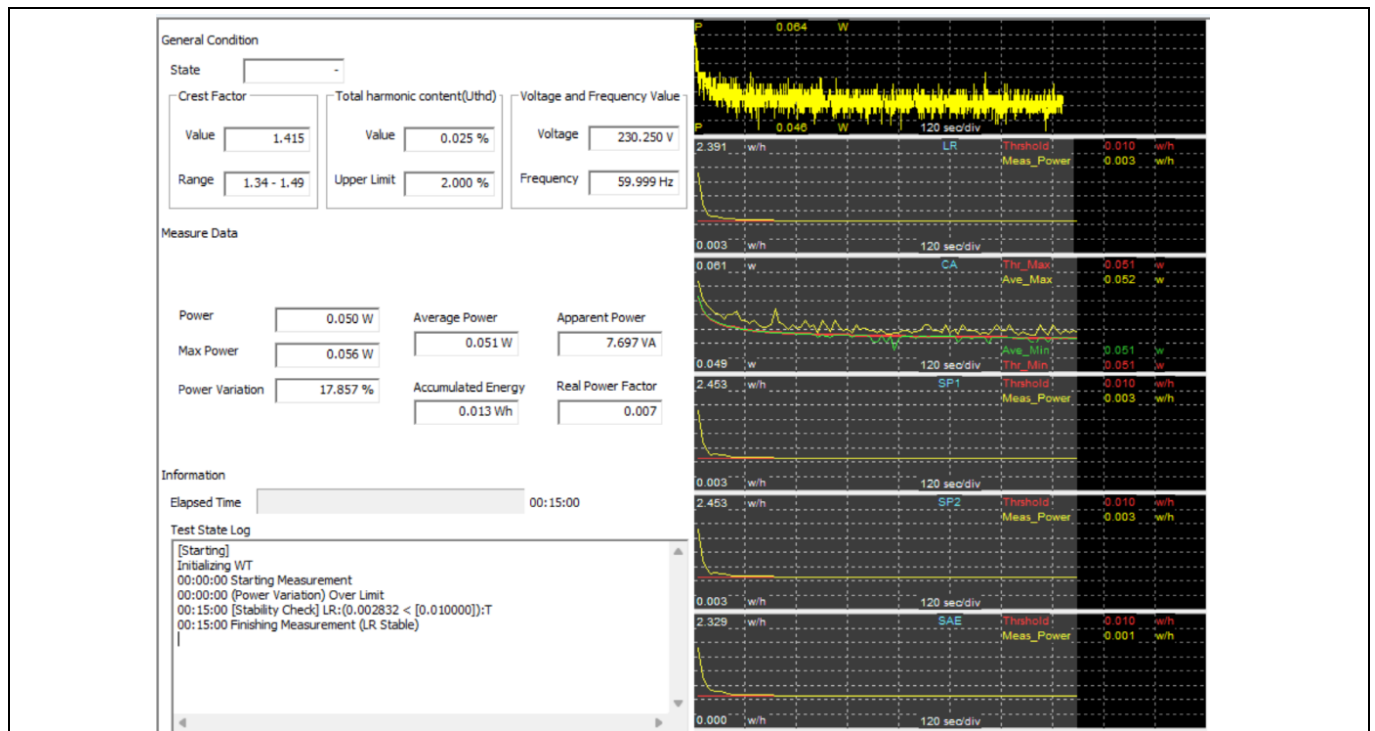


Figure 10 Detailed power measurement results @230Vac, 50 Hz

3.3 Output voltage ripple and noise peak-peak

The ripple and noise are measured with a 10- μ F E-cap and a 104K ceramic capacitor at Vbus, and the oscilloscope bandwidth is set at 20 MHz. The probe is needed to remove the outside plastic protector and GND wire; instead, a spring PIN is necessary for directly grounding. For connection details, see [Figure 11](#).

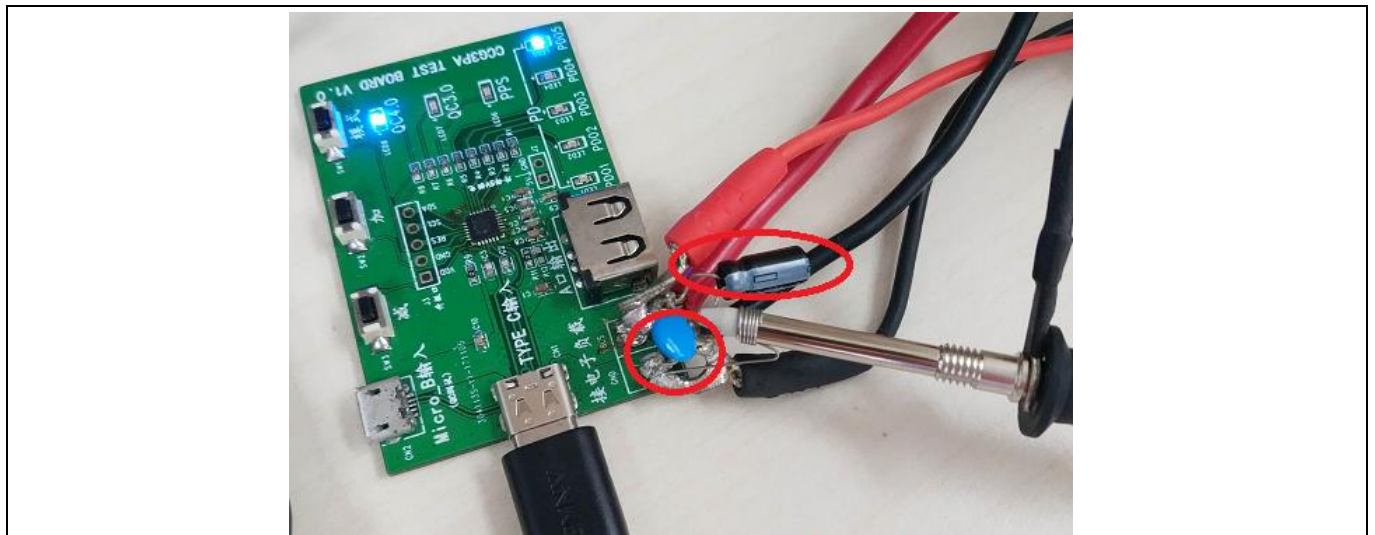
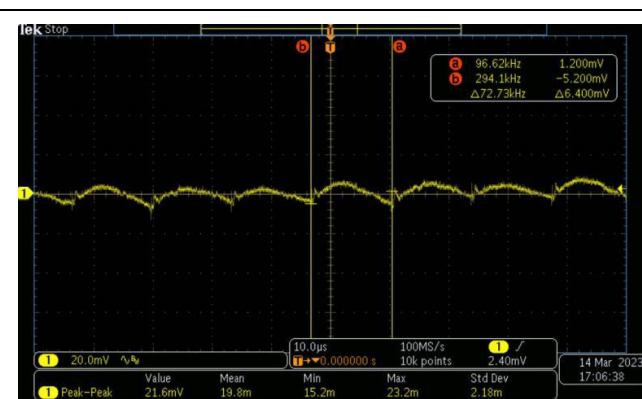
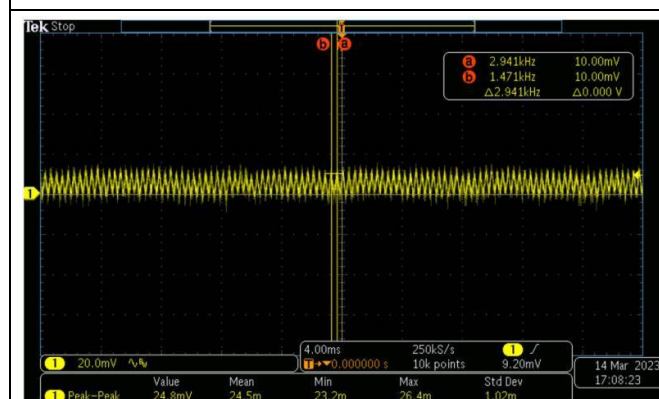
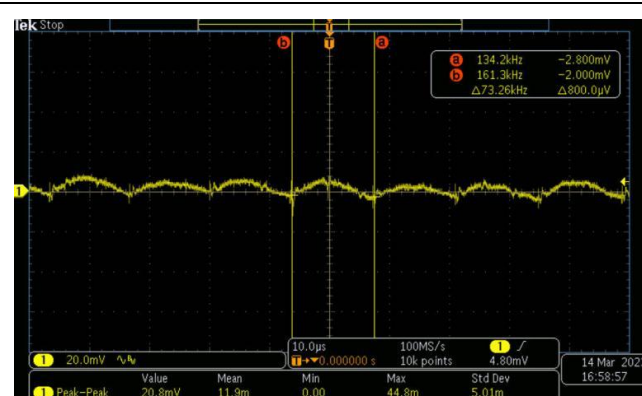
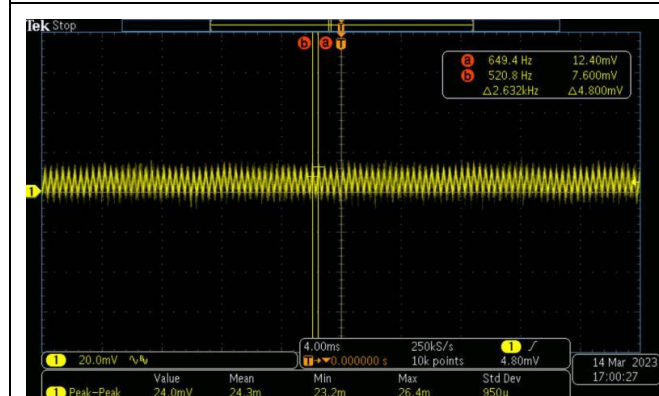
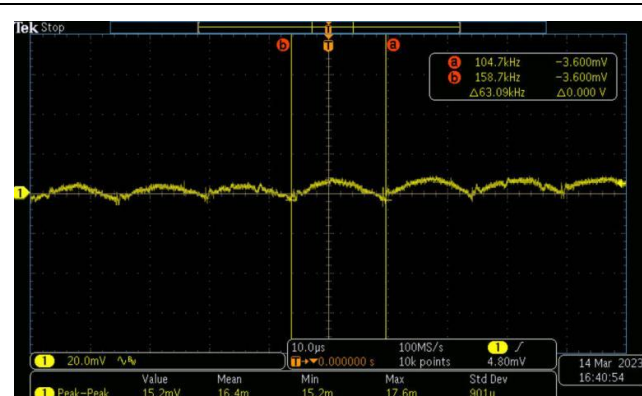
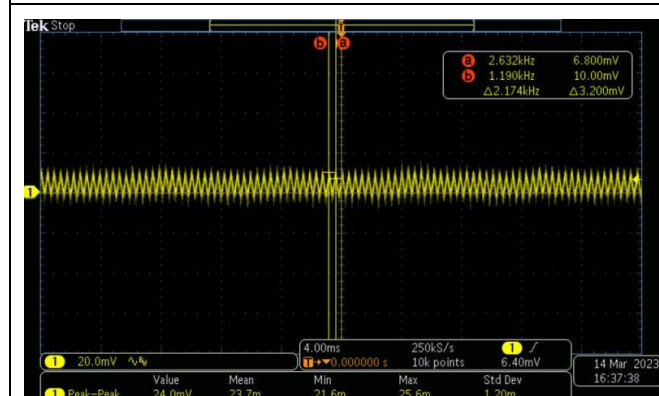
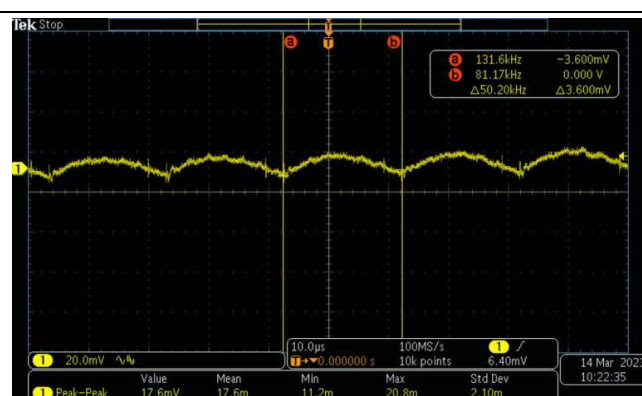
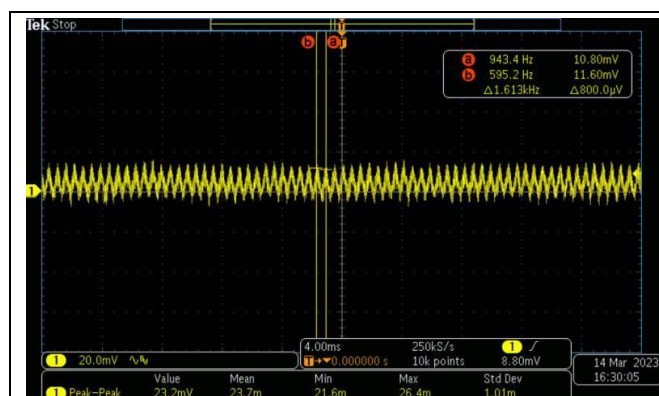


Figure 11 Ripple probe used (connected at board end)

65-W ATQ GAN USB PD dual-C power charger and adaptor solution demo board (REF_65W_2C_GAN_PAG1) test report



Power management test results



65-W ATQ GAN USB PD dual-C power charger and adaptor solution demo board (REF_65W_2C_GAN_PAG1) test report

Power management test results

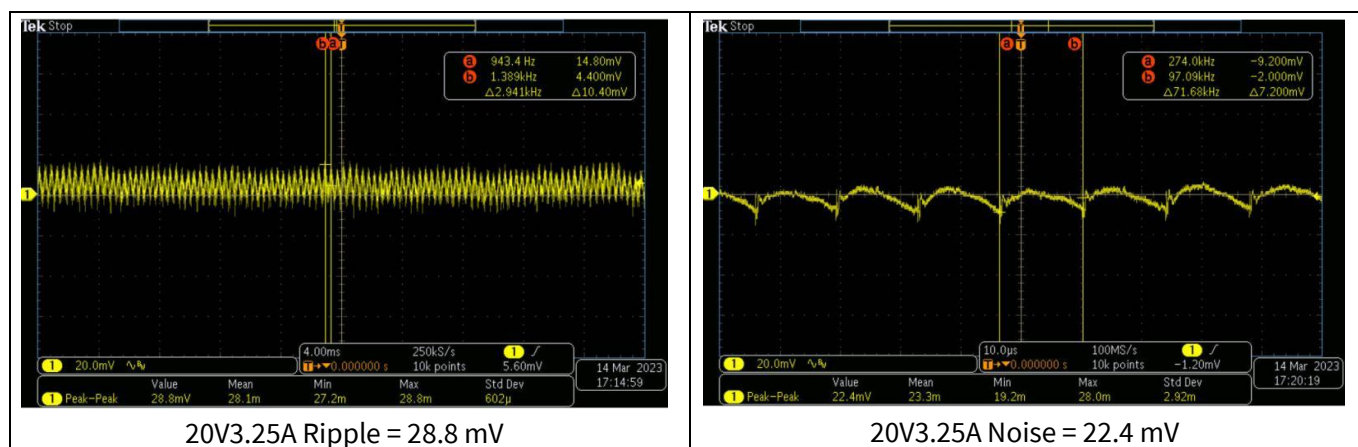
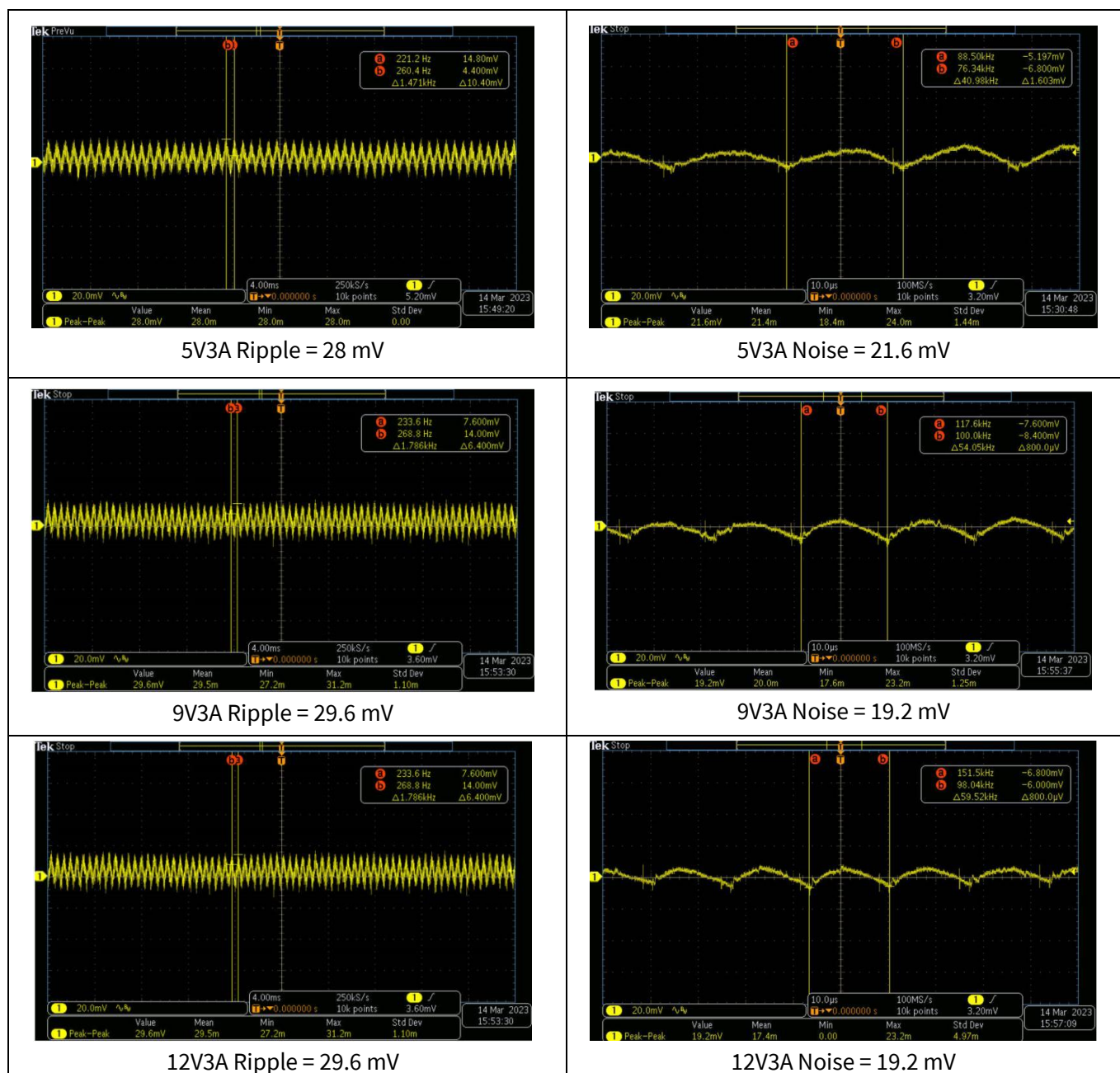


Figure 12 Ripple and noise at 115Vac 60Hz (CH1: Vbus_c)



65-W ATQ GAN USB PD dual-C power charger and adaptor solution demo board (REF_65W_2C_GAN_PAG1) test report

Power management test results

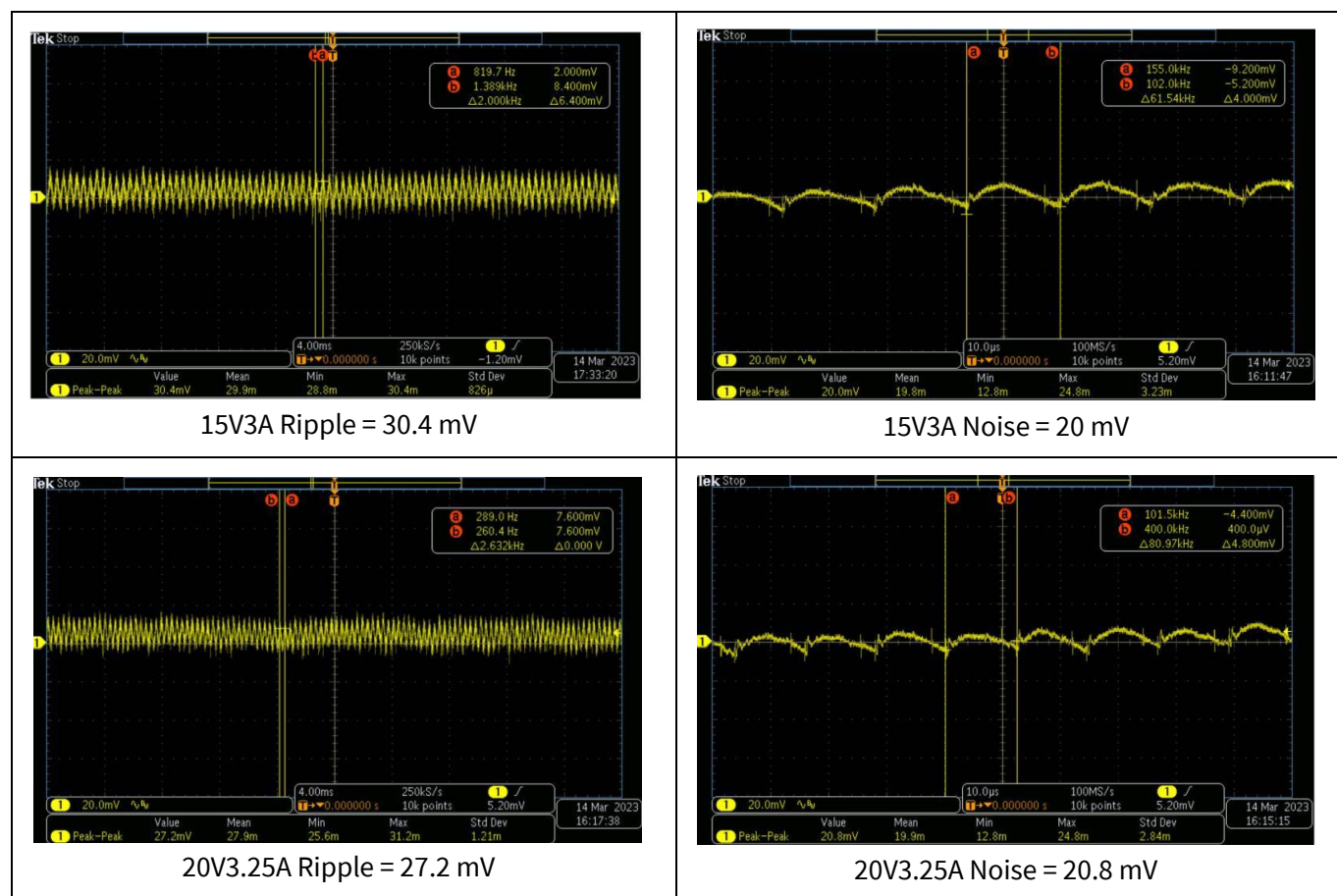


Figure 13 Ripple and noise at 230Vac 50 Hz (CH1: Vbus_c)

Power management test results

3.4 Output voltage dynamic response

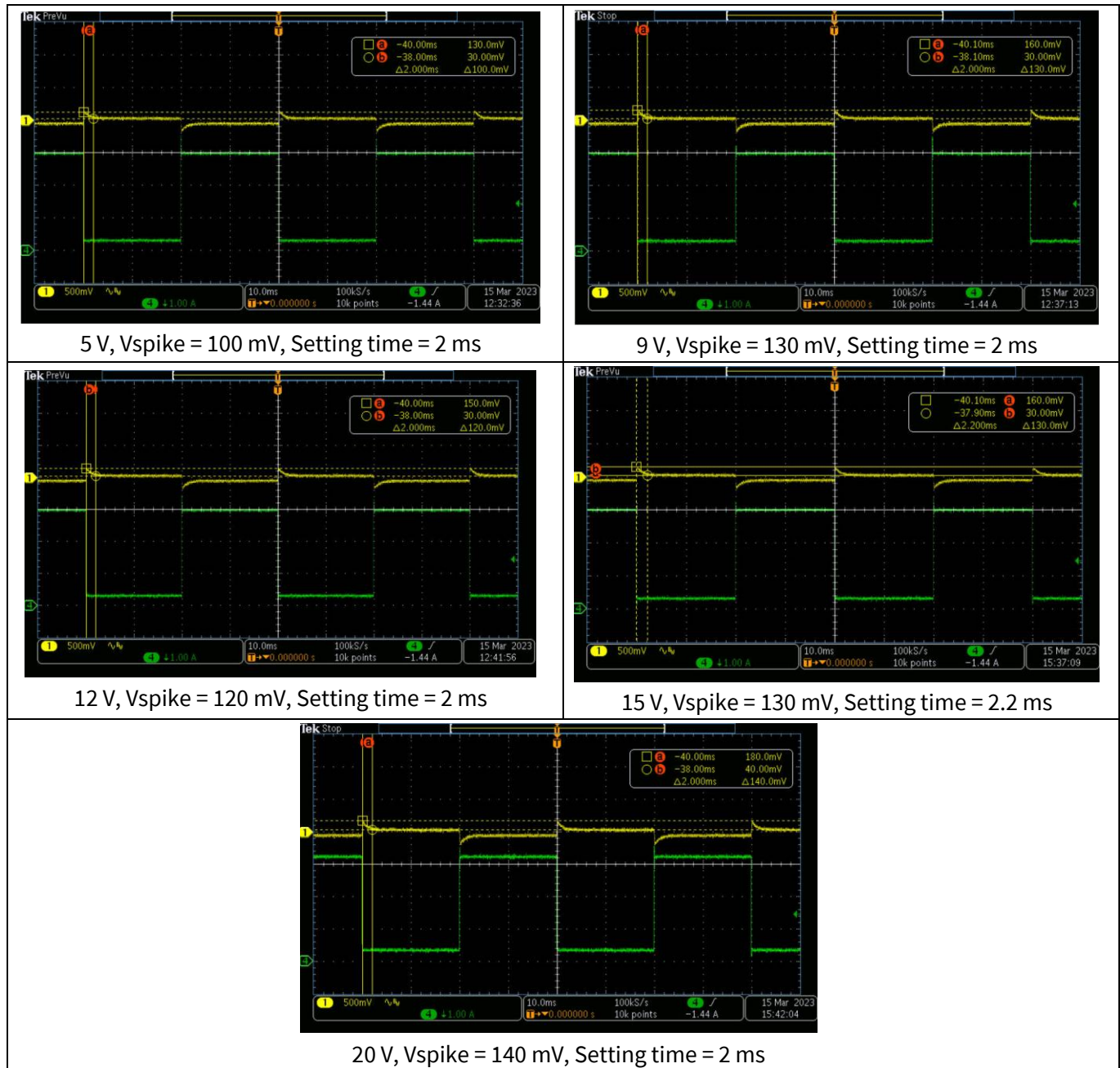


Figure 14 Output voltage dynamic response at Load=100%-10%, T1 = 20 ms, T2 = 20 ms, Slew = 0.5 A/μs, Vac = 115/60 Hz (CH1: Vbus_c, Ch4: Iout)

65-W ATQ GAN USB PD dual-C power charger and adaptor solution demo board (REF_65W_2C_GAN_PAG1) test report

Power management test results

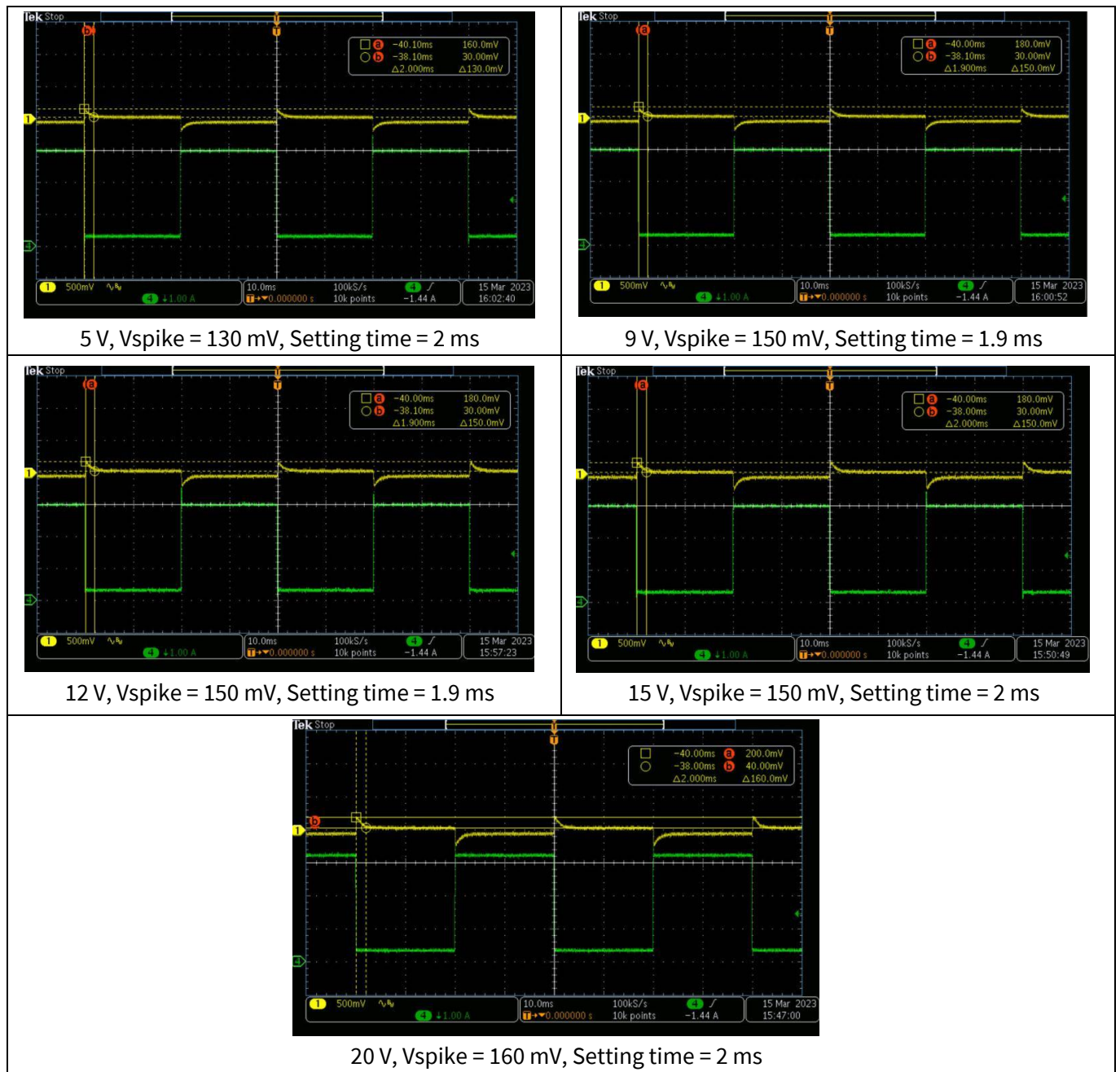


Figure 15 Output voltage dynamic response at Load=100%-10%, T1 = 20 ms, T2 = 20 ms, Slew = 0.5 A/ μ s, Vac = 230/50 Hz (CH1: Vbus_c, Ch4: Iout)

65-W ATQ GAN USB PD dual-C power charger and adaptor solution demo board (REF_65W_2C_GAN_PAG1) test report

Power management test results

3.5 Output current dynamic response

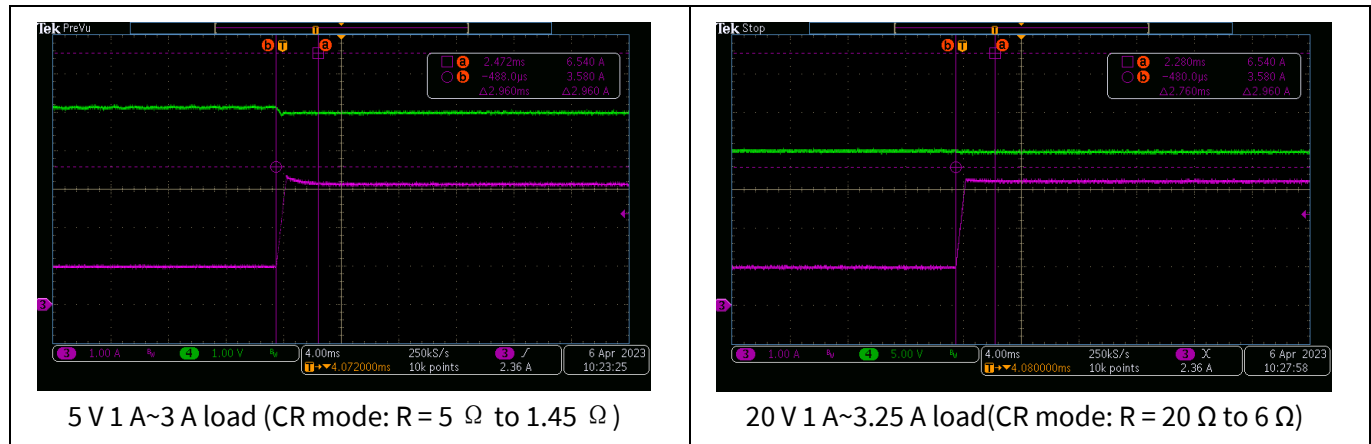


Figure 16 Output current dynamic response at 115Vac, 60 Hz, CR mode at E-load (CH4: Vbus_c, Ch3: Iout)

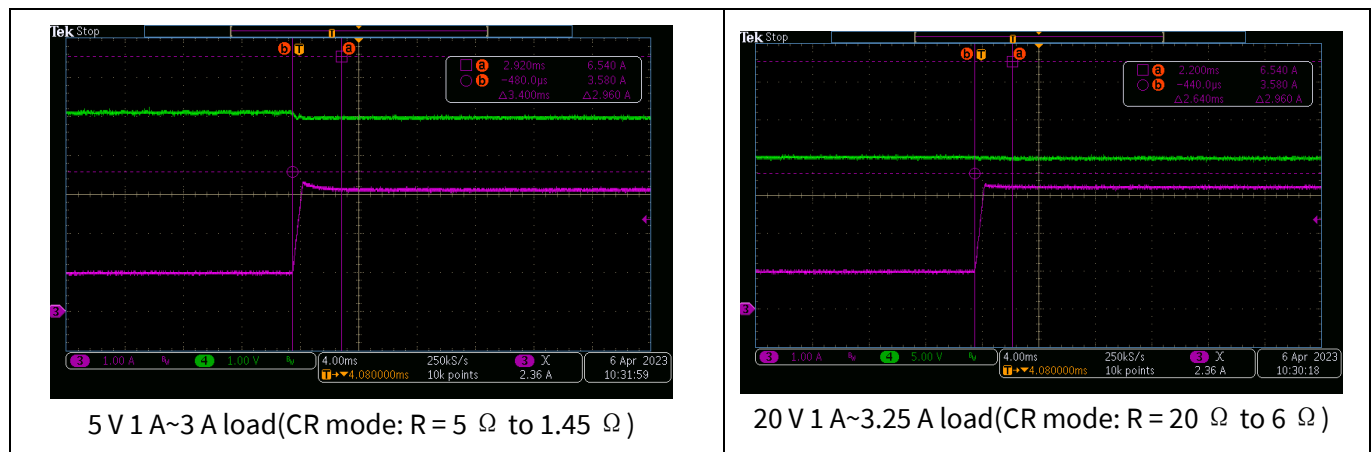


Figure 17 Output current dynamic response at 230Vac, 50 Hz, CR mode at E-load (CH4: Vbus_c, Ch3: Iout)

65-W ATQ GAN USB PD dual-C power charger and adaptor solution demo board (REF_65W_2C_GAN_PAG1) test report

Power management test results

3.6 Start-up turn-on delay

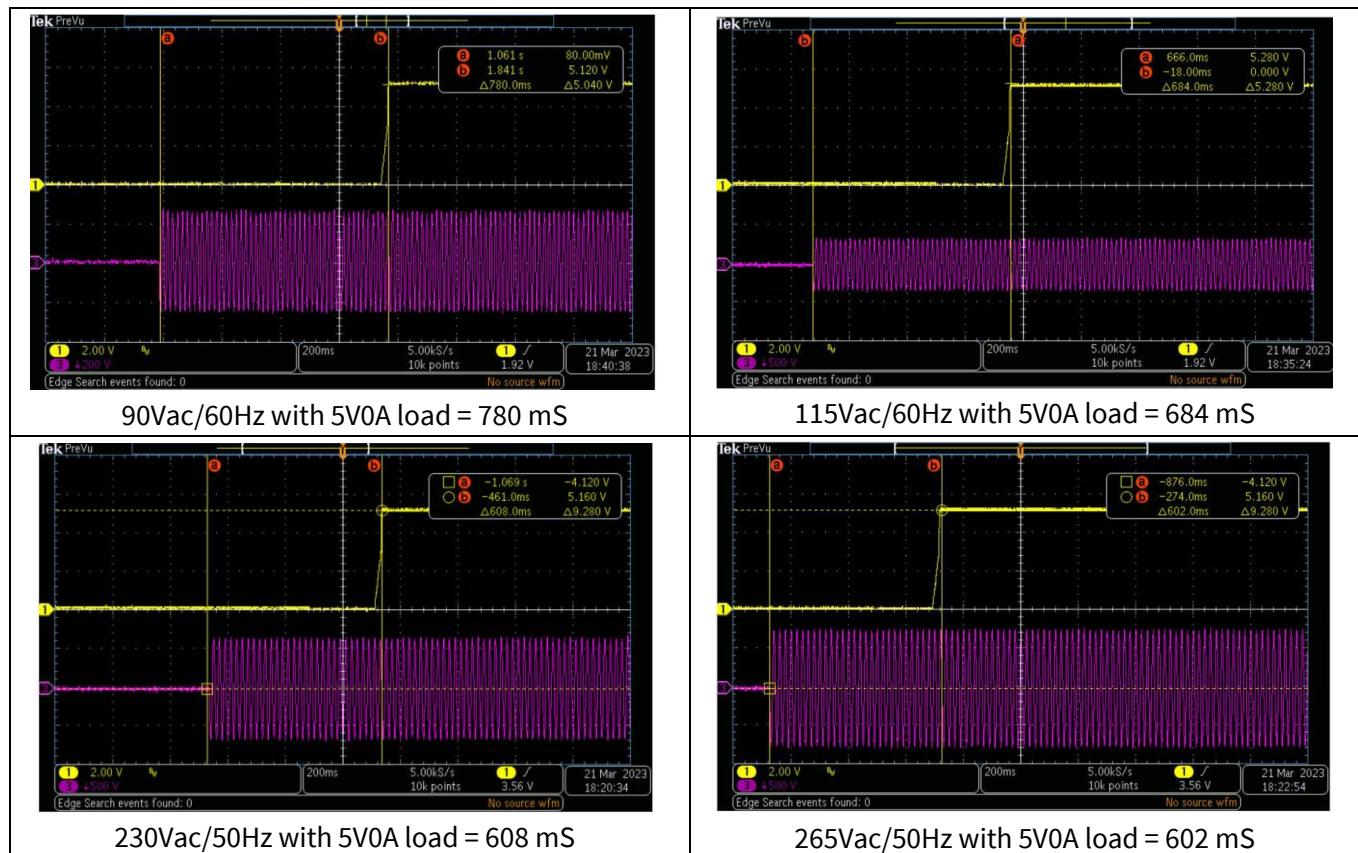


Figure 18 Start-up turn-on delay at various AC input, (CH1: Vbus_c, Ch3: AC input)

3.7 Start-up turn-on rise time

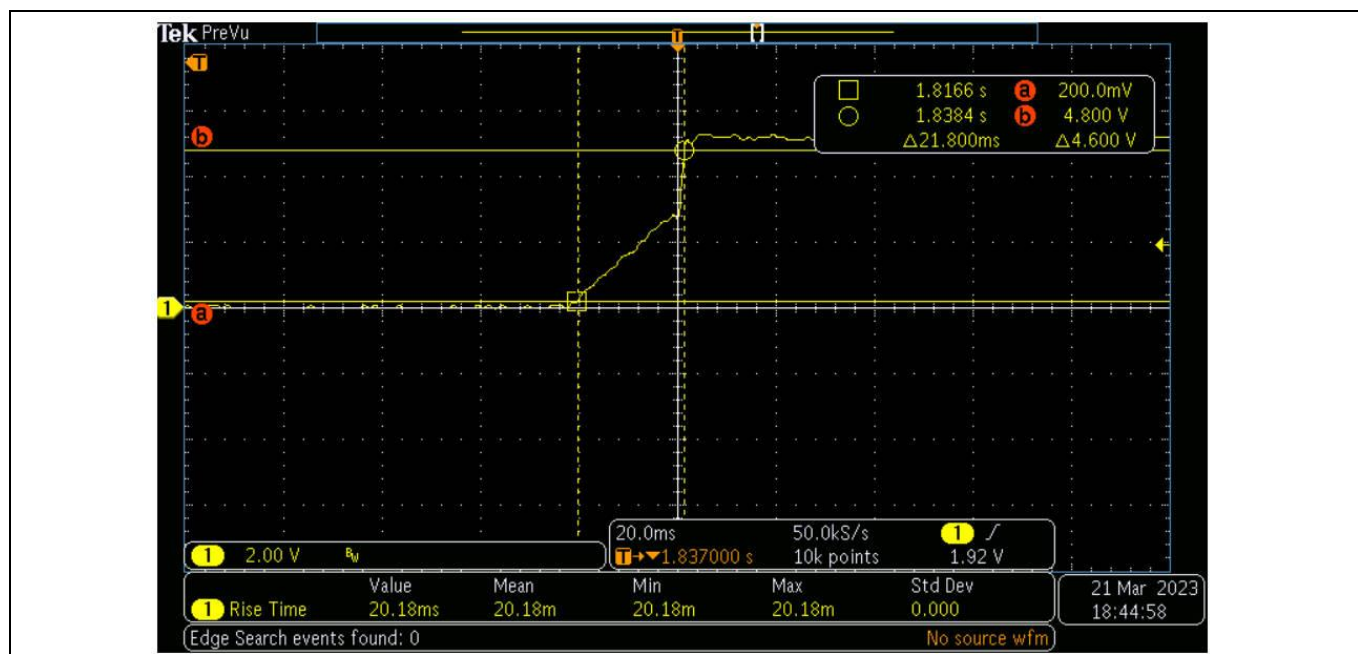


Figure 19 Start-up rise time at 90Vac/60Hz with 5V0A load = 21.8 mS (CH1: Vbus_c)

65-W ATQ GAN USB PD dual-C power charger and adaptor solution demo board (REF_65W_2C_GAN_PAG1) test report

Power management test results

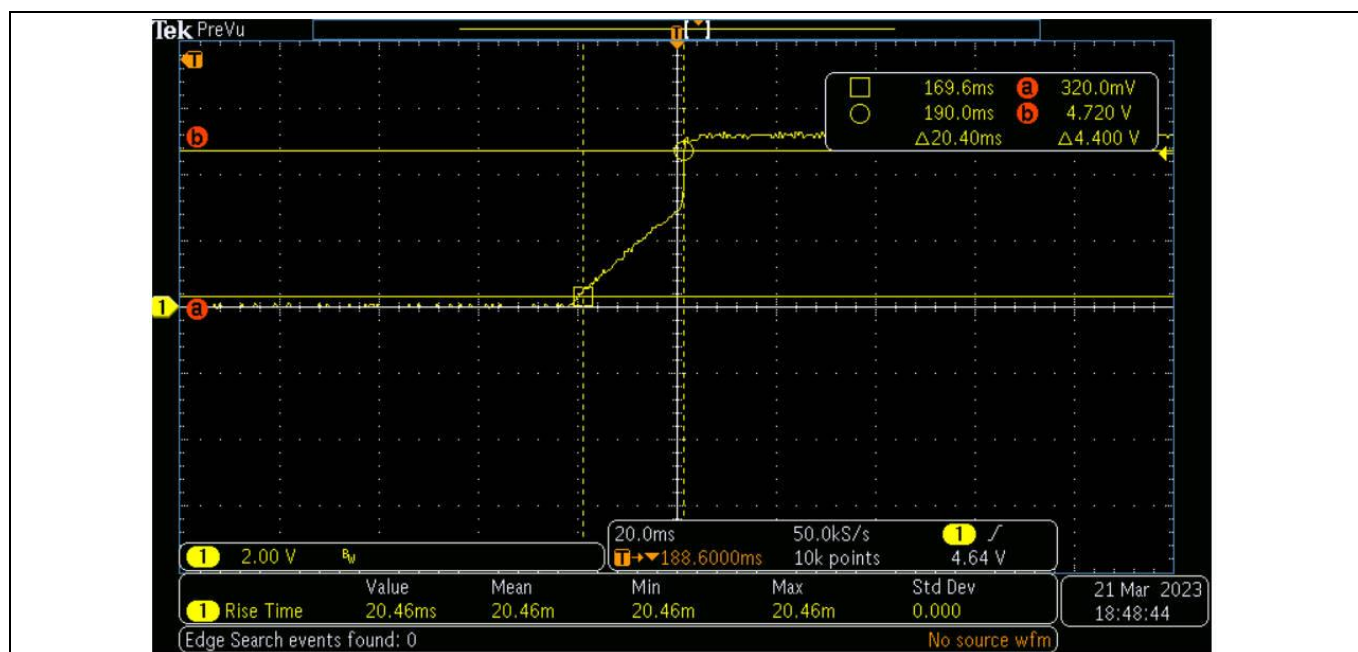


Figure 20 Start-up rise time at 265Vac/50Hz with 5V0A load = 20.4 ms (CH1: Vbus_c)

3.8 Shut-down Hold-up and Fall time

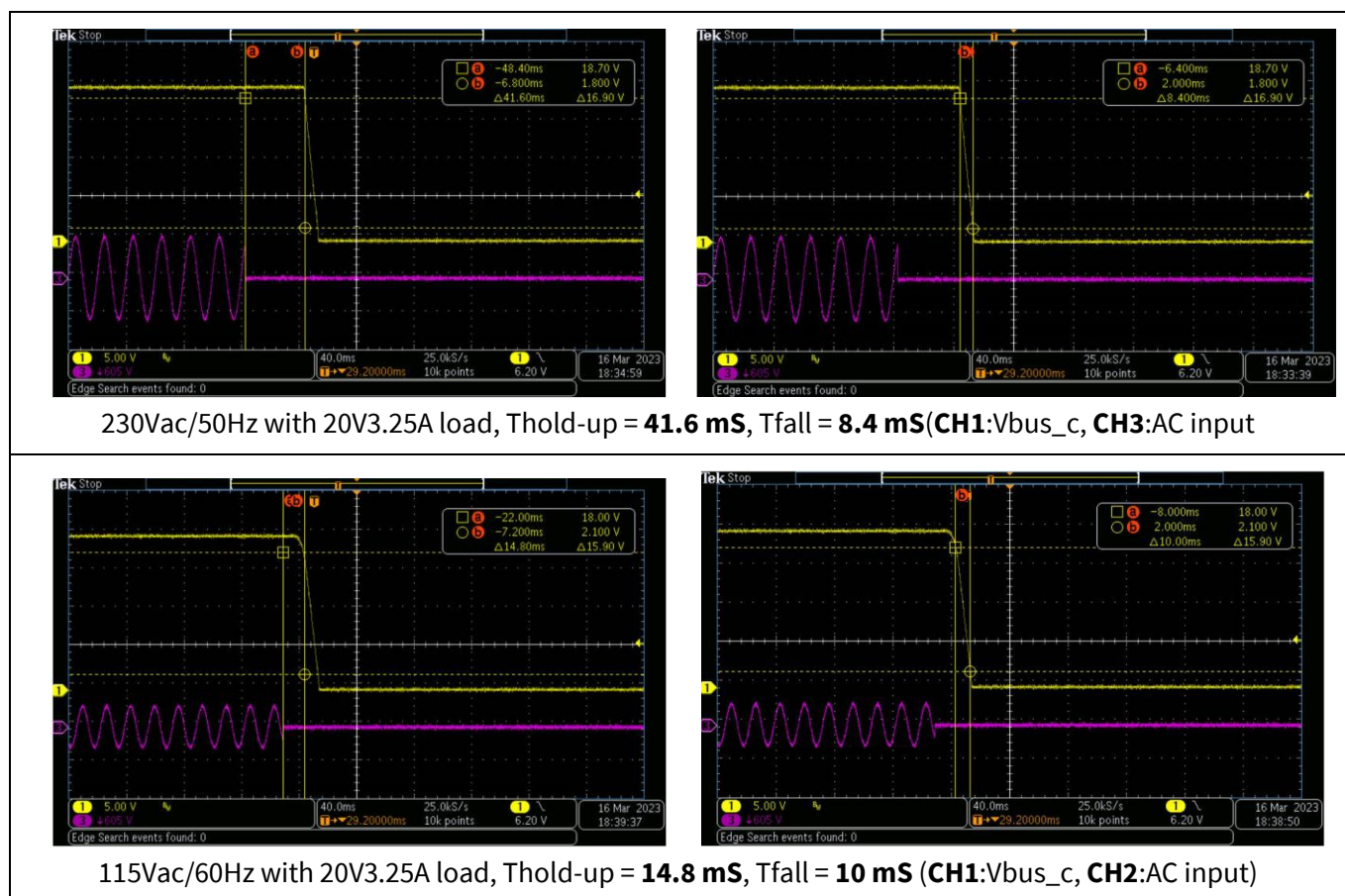
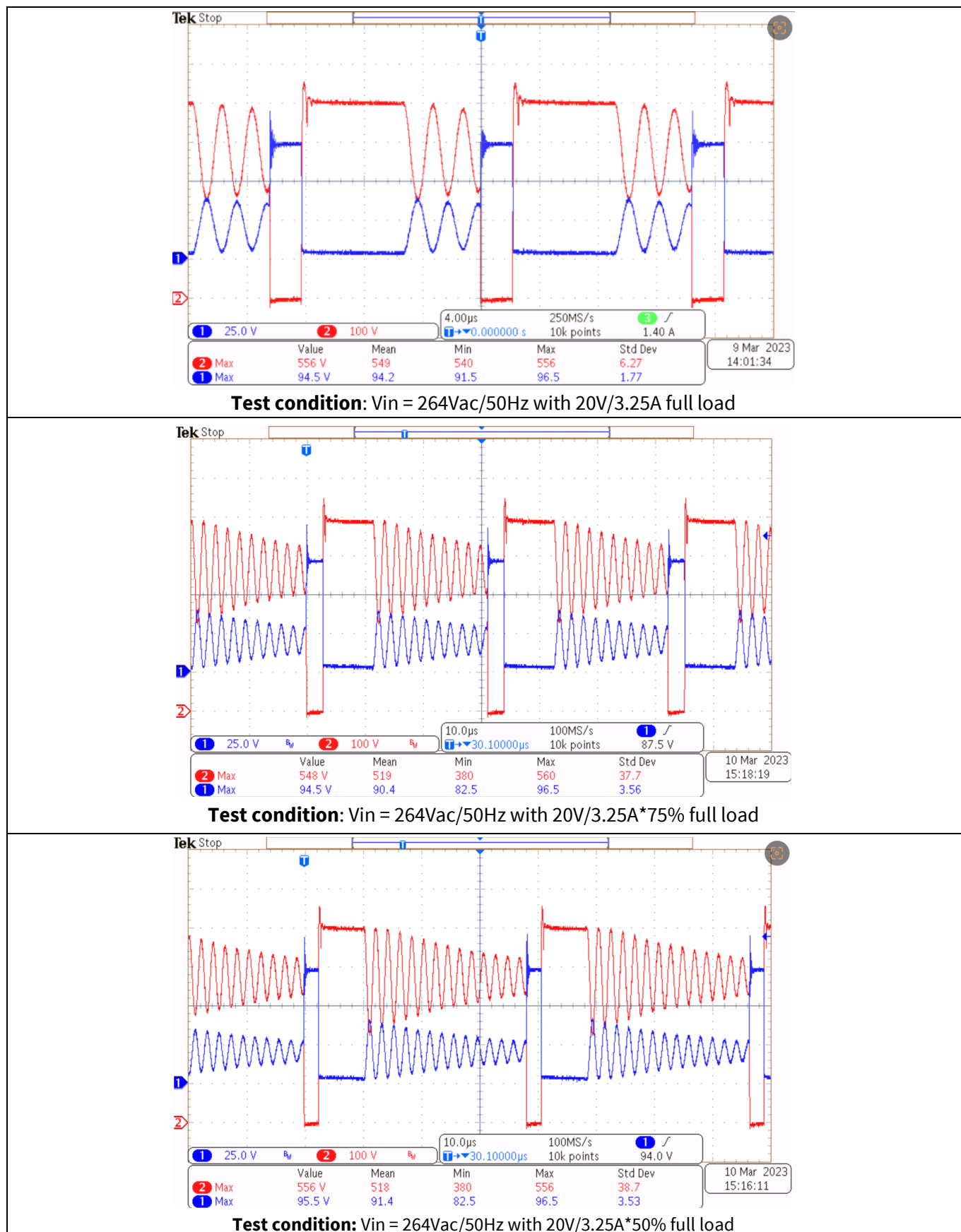


Figure 21 Shut-down Hold-up and Fall time

Power management test results

3.9 Switch voltage stress



65-W ATQ GAN USB PD dual-C power charger and adaptor solution demo board (REF_65W_2C_GAN_PAG1) test report

Power management test results

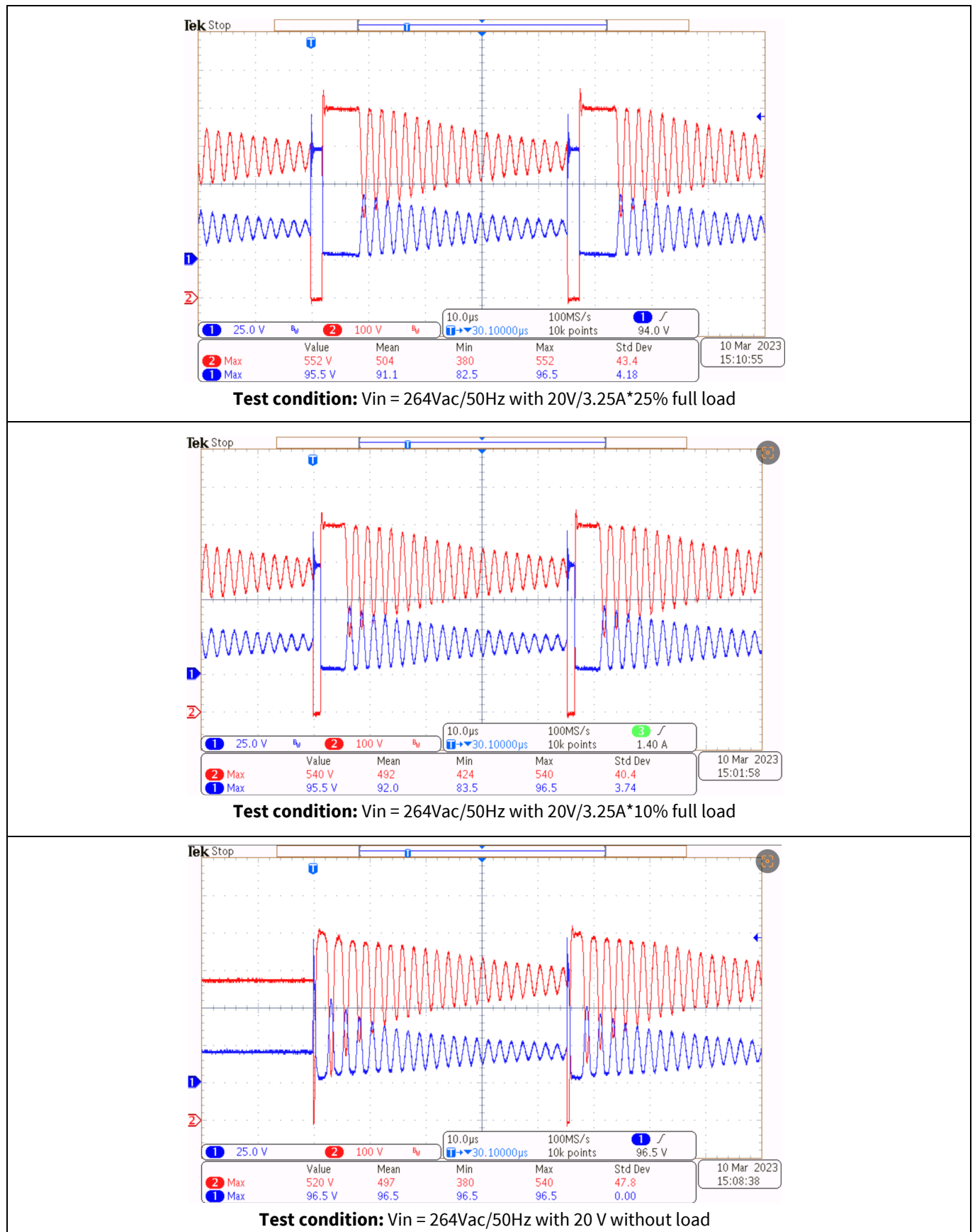


Figure 22 Voltage stress on primary FET and SR FET (CH1: V_{ds_sr} , CH2: V_{ds_pri})

65-W ATQ GAN USB PD dual-C power charger and adaptor solution demo board (REF_65W_2C_GAN_PAG1) test report

Power management test results

3.10 Overcurrent protection

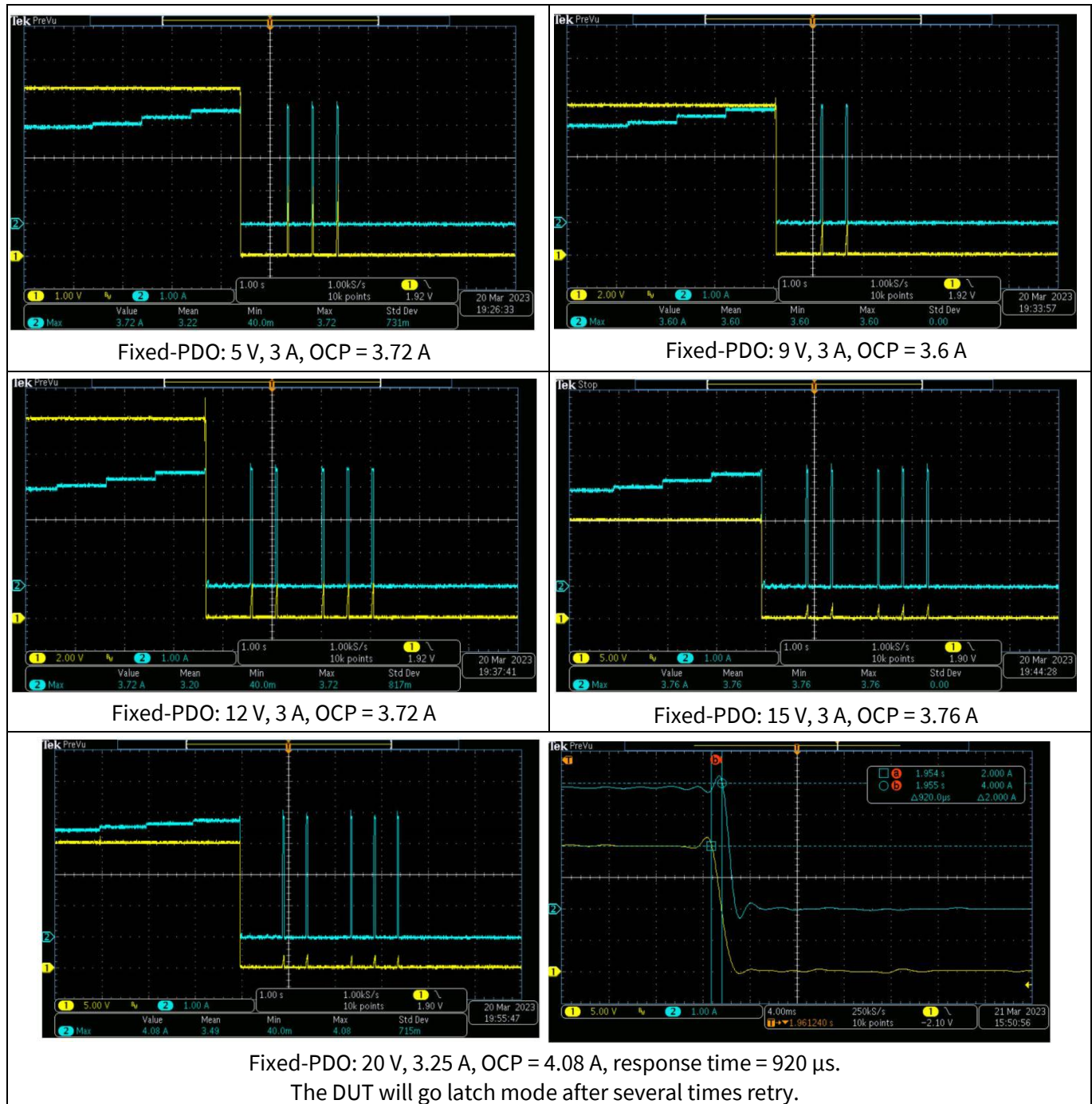


Figure 23 Overcurrent protection at 115 V, 60 Hz with full load of each PDO (CH1: Vbus_c, CH2: Iout)

3.11 Short-circuit protection

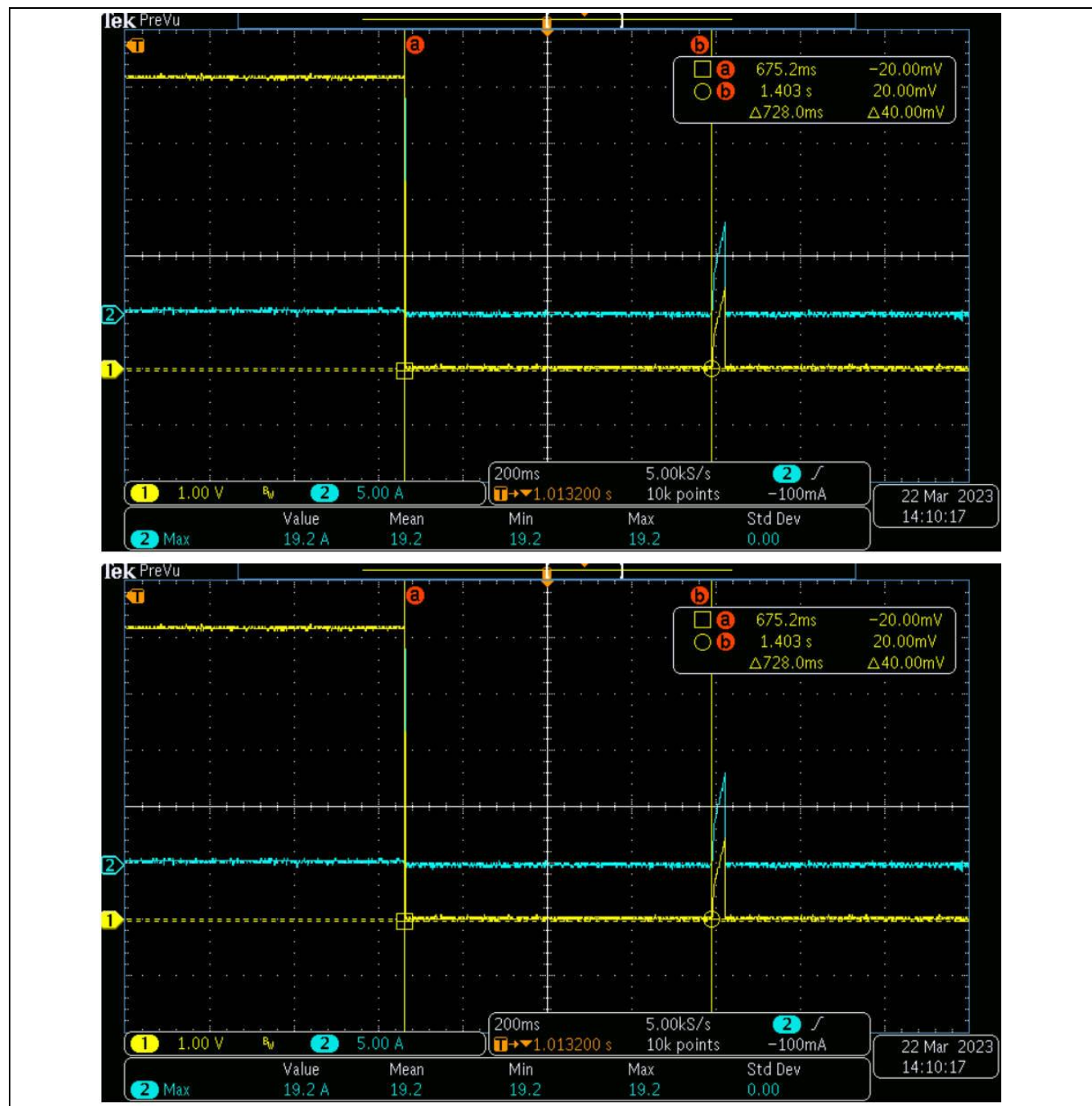


Figure 24 Short-circuit protection at 115Vac, 5V0.3A load. Short E-load output (CH1: Vbus_c, CH2: Iout)

65-W ATQ GAN USB PD dual-C power charger and adaptor solution demo board (REF_65W_2C_GAN_PAG1) test report

Power management test results

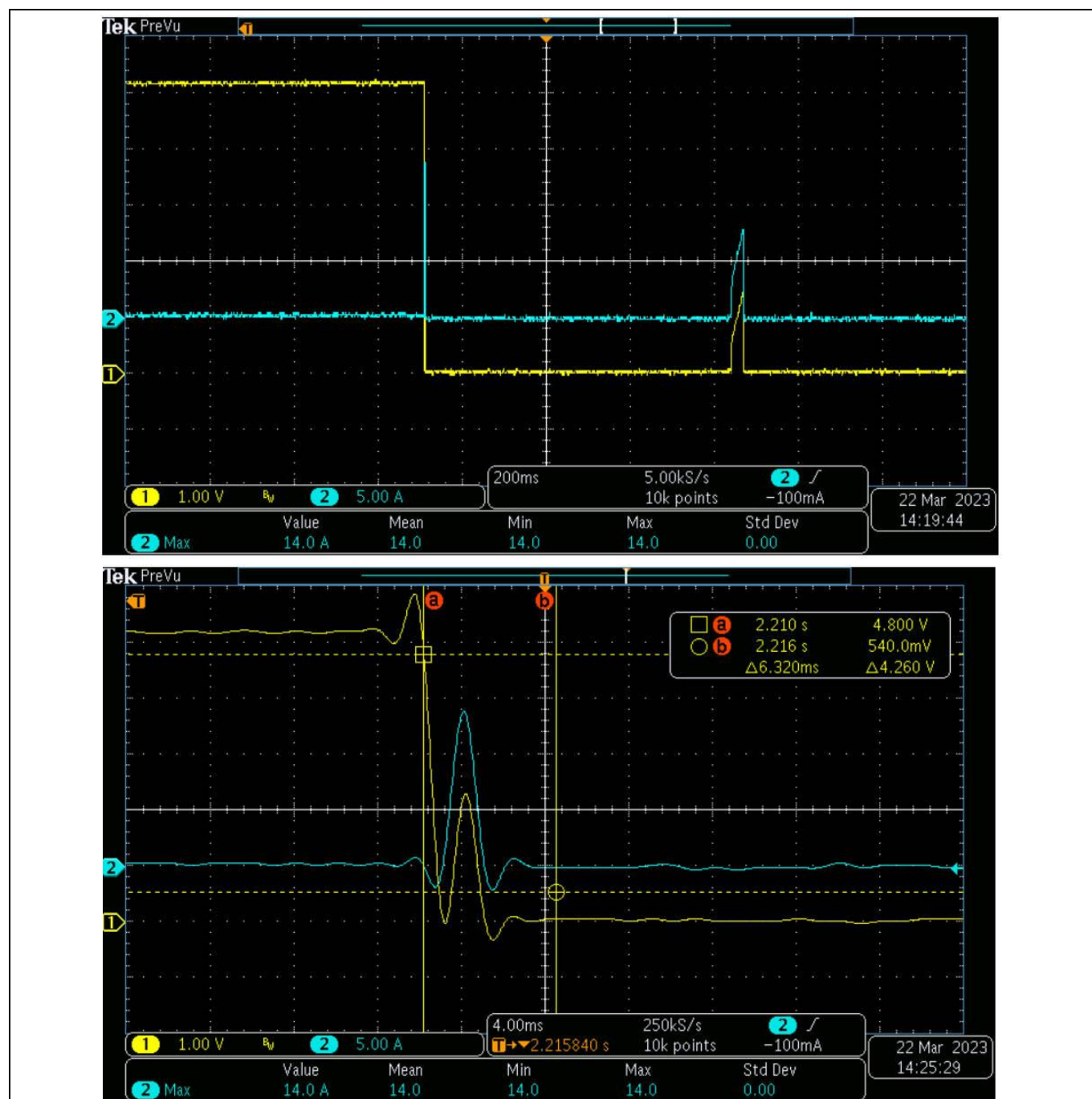
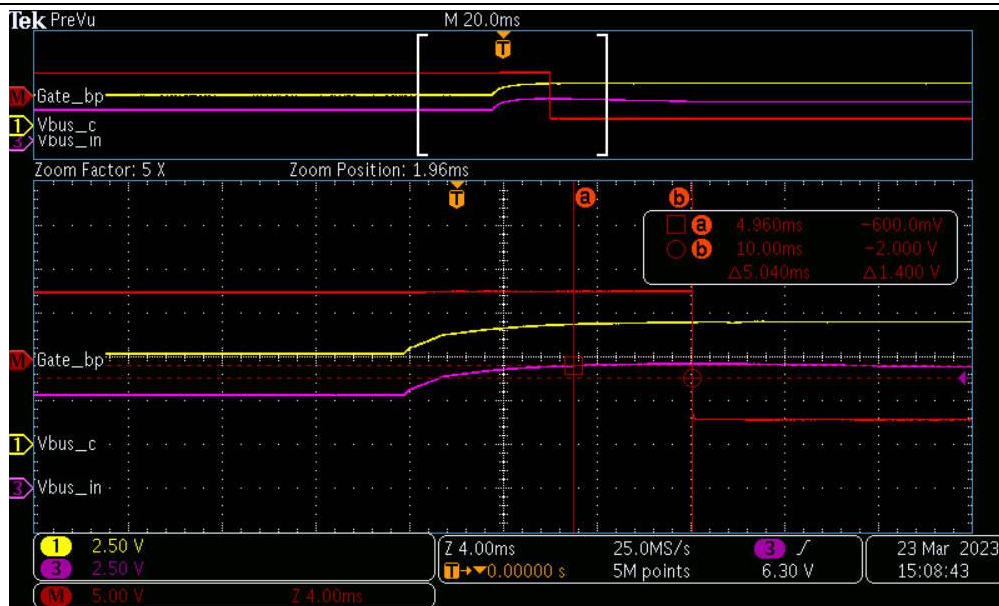


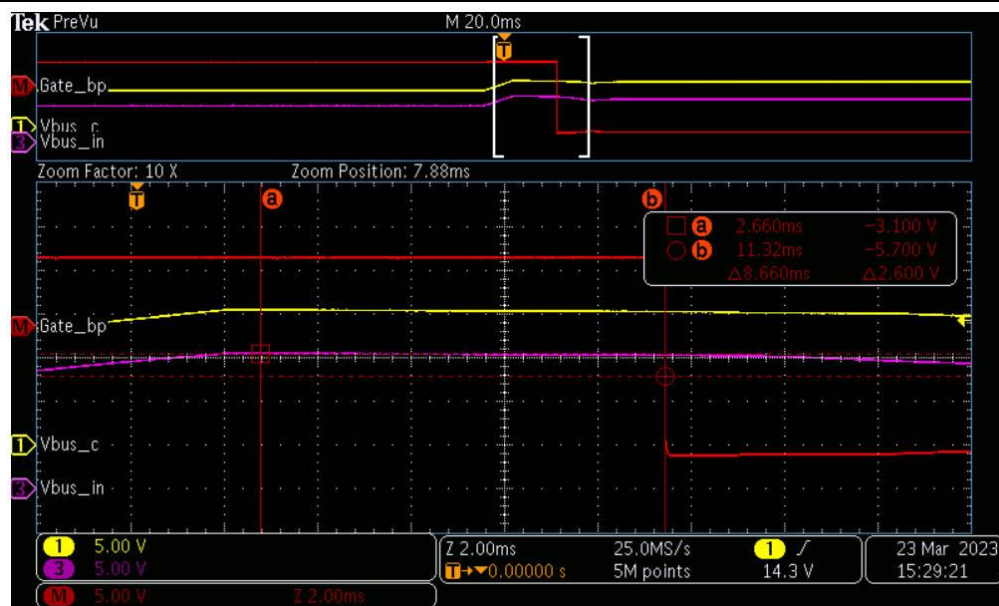
Figure 25 Short-circuit protection at 230Vac, 5V0.3A load. Short E-load output (CH1: Vbus_c, CH2: Iout)

Power management test results

3.12 Overvoltage protection



PDO 5 V, apply 7 V DC source to Vbus_c and GND. Vovp = 7 V on Vbusin

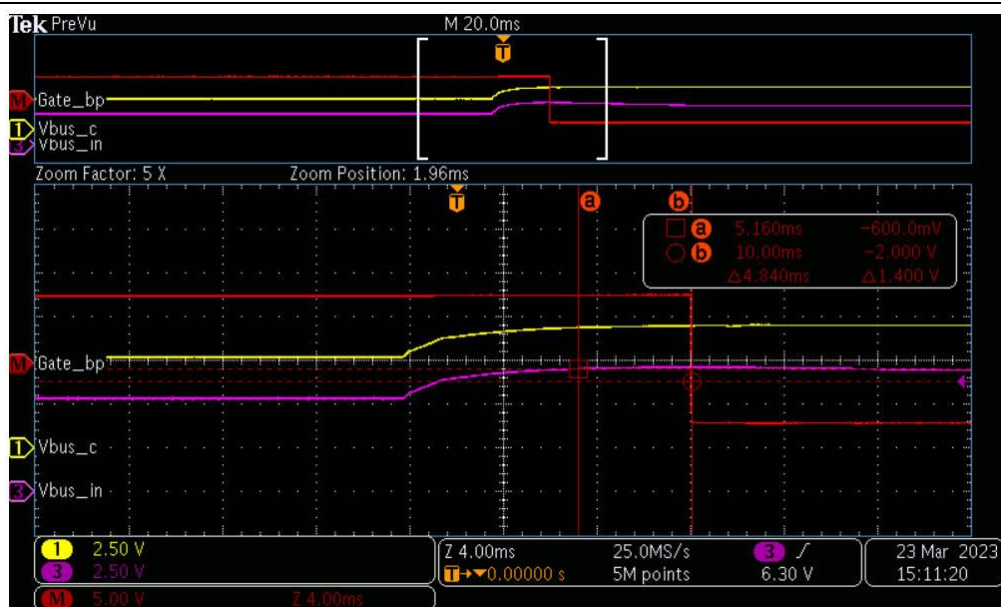


PDO 12 V, apply 15 V DC source to Vbus_c and GND, Vovp = 15 V on Vbusin

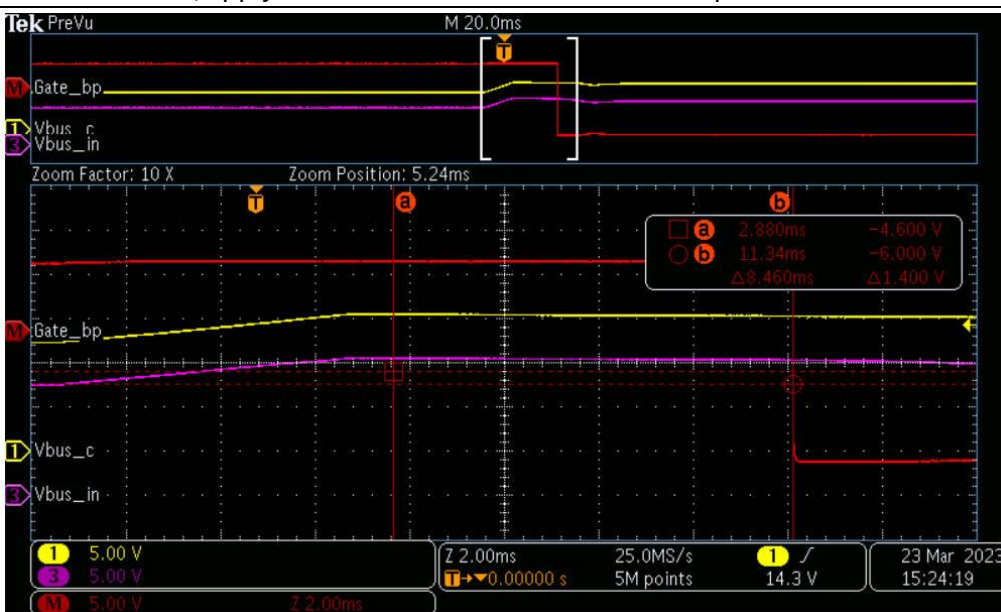
Figure 26 Overvoltage protection at 115Vac, 0 A load

65-W ATQ GAN USB PD dual-C power charger and adaptor solution demo board (REF_65W_2C_GAN_PAG1) test report

Power management test results



PDO 5 V, apply 7 V DC source to Vbus_c & GND. Vovp = 7 V on Vbusin



PDO 12 V, apply 15 V DC source to Vbus_c and GND, Vovp = 15 V on Vbusin

Figure 27 Overvoltage protection at 230Vac, 0 A load

65-W ATQ GAN USB PD dual-C power charger and adaptor solution demo board (REF_65W_2C_GAN_PAG1) test report

Power management test results

3.13 Overtemperature protection

- Single port C1 (20V3.25A)
 - OTP trigger point = 100°C Bypass MOSFET close and Vbus_c drops to 0 V
 - OTP resume point = 90°C, Bypass MOSFET turn on again and Vbus_c resumes to 20 V
- Dual port C1(5V3A) + port C2(12V3A)
 - OTP trigger point = 100°C, Buck MOSFET close, Vbus_c1 and Vbus_c2 drops to 0 V
 - OTP resume point = 90°C, Buck MOSFET turn on again, Vbus_c1 resumes to 5 V and Vbus_c2 resumes to 12 V

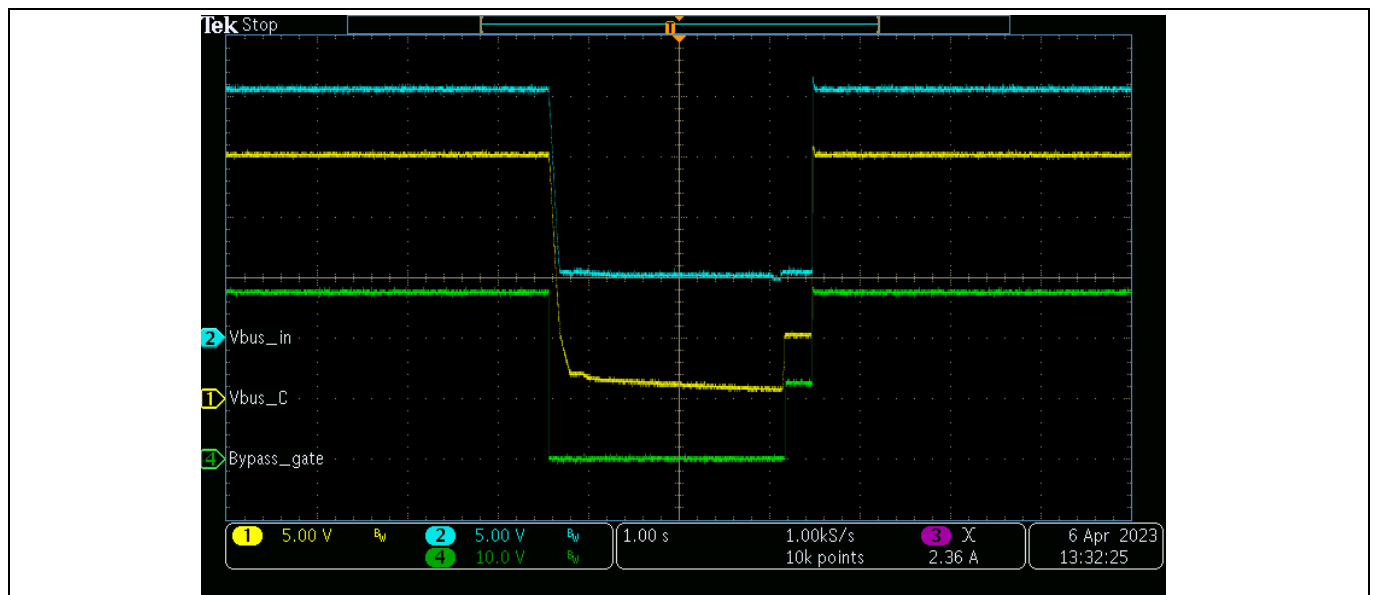


Figure 28 Single port C (20V 3.25A)



Figure 29 Dual port C (12V 3A + 5V 3A)

The sense point of temperature is from NTC 100K resistor on the Type C1 and Type C2 board.

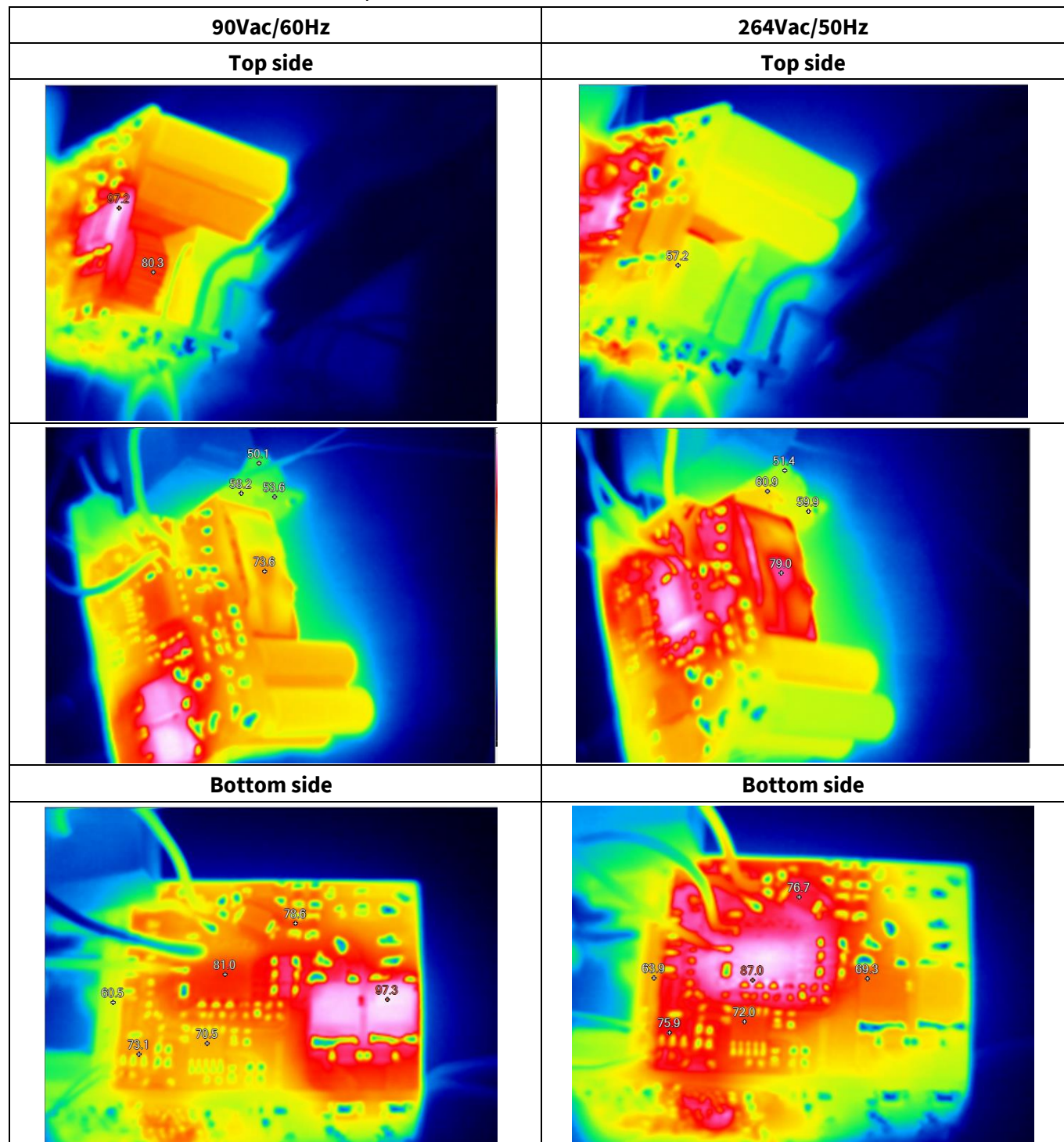
65-W ATQ GAN USB PD dual-C power charger and adaptor solution demo board (REF_65W_2C_GAN_PAG1) test report

Power management test results

3.14 Thermal captures

1. **Test condition:** Single port Vout = 20 V, Iout = 3.25 A Full load.

Ambient condition: 25°C and in open-frame and run 60 Minutes.



65-W ATQ GAN USB PD dual-C power charger and adaptor solution demo board (REF_65W_2C_GAN_PAG1) test report

Power management test results

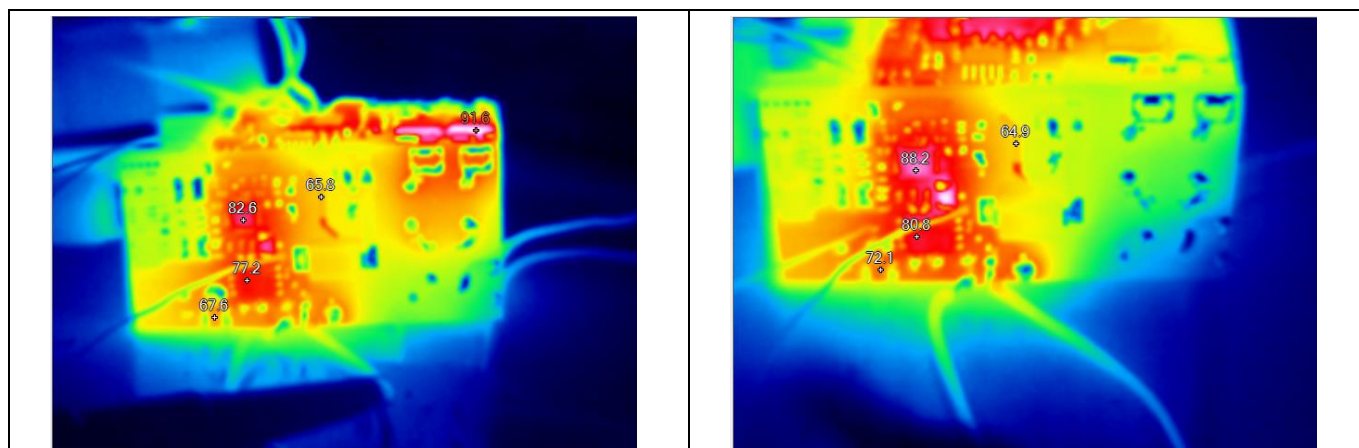


Figure 30 Thermal captures (Single port Vout = 20 V, Iout = 3.25 A Full load)

Table 7 Temperature measurements

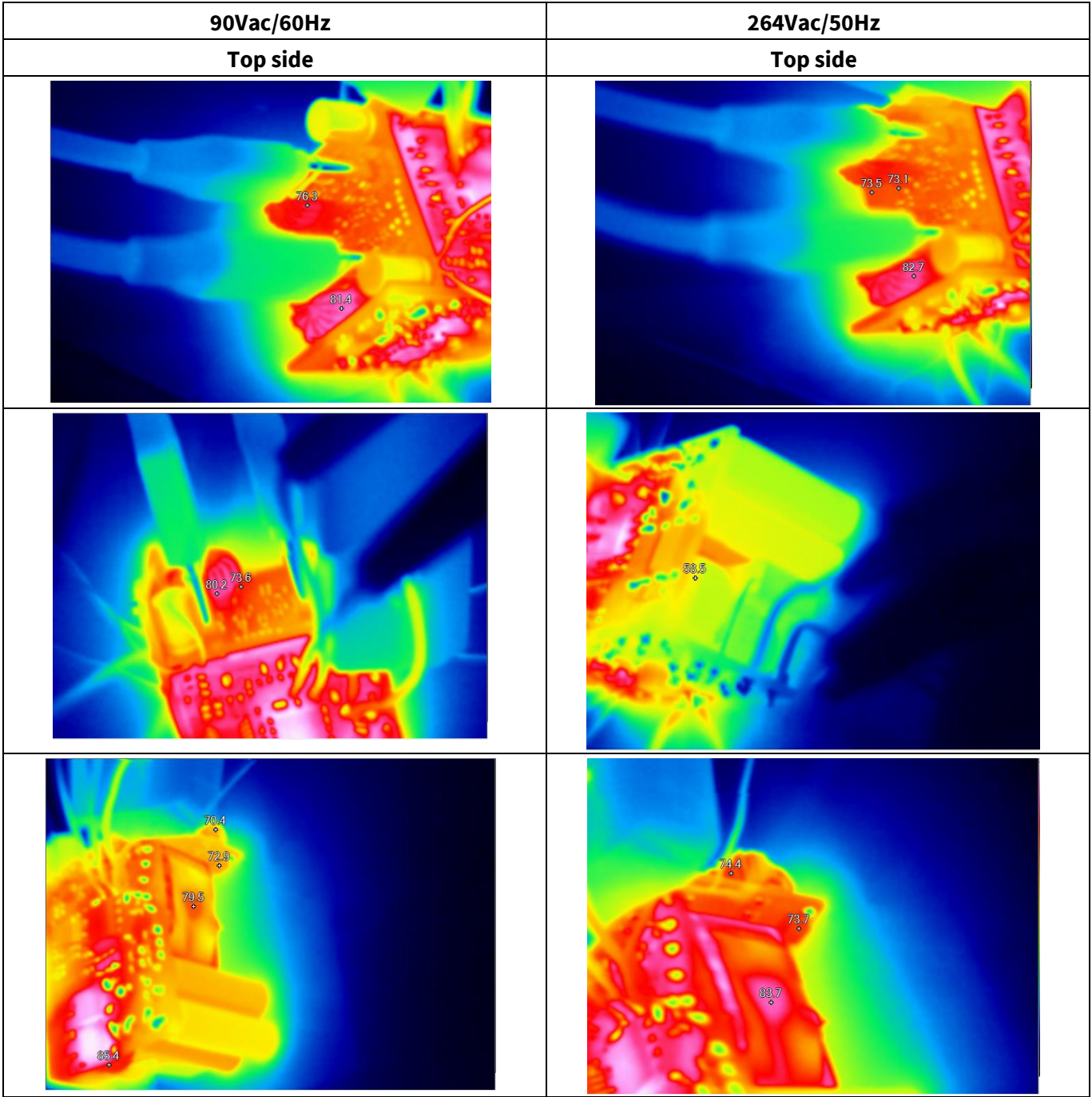
Measured key component	Temperature (°C) @ 90Vac/60Hz	Temperature (°C) @ 264Vac/50Hz
Transformer ATQ24 core (T1)	73.6	79
Transformer ATQ24 wire (T1)	73	78.6
Pulse transformer (T2)	65.8	64.9
Primary- MOSFET: IGLD60R190D1AUMA1 (Q4)	81	87
SR MOSFET: BSC050N10NS5 (Q3)	77.2	80.8
Primary snubber (D1,R5//R37,R2//R3//C2)	78.6	76.7
SR snubber (C29+R40)	67.6	72.1
Bridge diode: MSB407 (BD1//BD2)	97.3	69.3
EZ-PD™ PAG1P (U2)	70.5	72
EZ-PD™ PAG1S (U1)	82.6	88.2
Primary AUX LDO (Q2+D2)	72.7	75.9
CMC (LF2)	80.3	57.2
EZ-PD™ CCG7DC (U3)	60.5	63.9
Bypass MOSFET(Q7)	58.2	59.9
Power inductor(L3)	50.1	51.4

65-W ATQ GAN USB PD dual-C power charger and adaptor solution demo board (REF_65W_2C_GAN_PAG1) test report



Power management test results

2. **Test condition:** Port 1 Vout = 9 V, Iout = 2.22 A and Port 2 Vout = 20 V, Iout = 2.25 A
Ambient condition: 25°C and in open-frame and run 60 Minutes



65-W ATQ GAN USB PD dual-C power charger and adaptor solution demo board (REF_65W_2C_GAN_PAG1) test report

Power management test results

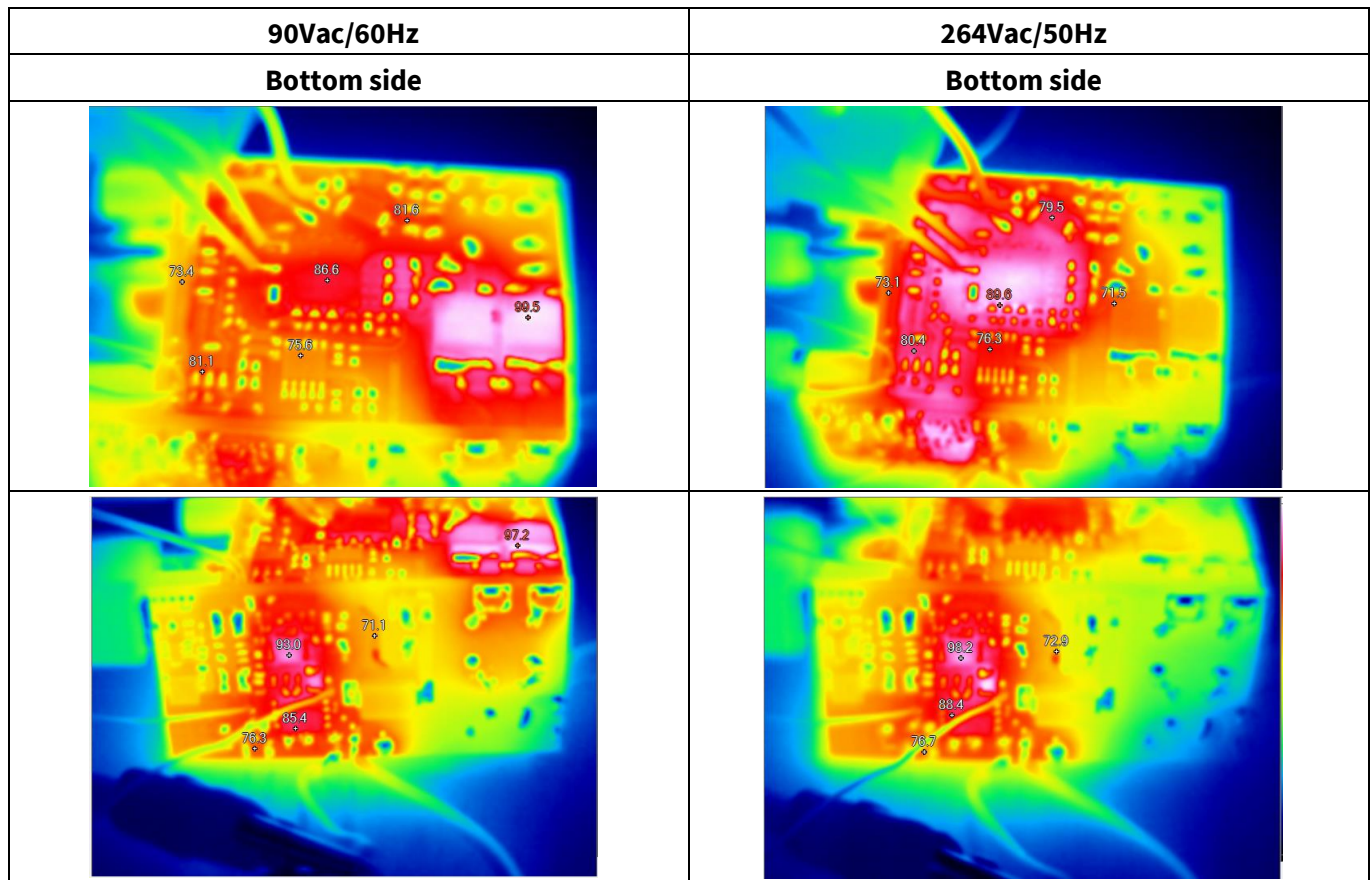


Figure 31 Thermal captures (Port 1 Vout = 9 V, Iout = 2.22 A and Port 2 Vout = 20 V, Iout = 2.25 A)

Table 8 Temperature measurements

Measured key component	Temperature (°C) @ 90Vac/60Hz	Temperature (°C) @ 264Vac/50Hz
Transformer ATQ24 core (T1)	79.5	83.7
Transformer ATQ24 wire (T1)	79	83
Pulse transformer (T2)	71.1	72.9
Primary- MOSFET: IGLD60R190D1AUMA1 (Q4)	86.8	89.6
SR MOSFET: BSC050N10NS5 (Q3)	85.4	88.4
Primary snubber (D1,R5//R37,R2//R3//C2)	81.6	79.5
SR snubber (C29+R40)	76.3	76.7
Bridge diode: MSB407 (BD1//BD2)	99.5	71.5
EZ-PD™ PAG1P (U2)	75.6	76.3
EZ-PD™ PAG1S (U1)	93	98.2
Primary AUX LDO (Q2+D2)	81.1	80.4
CMC (LF2)	85.4	58.5
EZ-PD™ CCG7DC (U3)	73.4	73.1
Buck MOSFET1 (Q1+Q9)	72.9	73.1
Buck MOSFET1 (Q6+Q5)	73.6	73.7
Power inductor1 (L2)	76.3	73.5

65-W ATQ GAN USB PD dual-C power charger and adaptor solution demo board (REF_65W_2C_GAN_PAG1) test report



Power management test results

Measured key component	Temperature (°C) @ 90Vac/60Hz	Temperature (°C) @ 264Vac/50Hz
Power inductor2 (L3)	81.4	82.7

3.15 Conducted emission



Figure 32 CE at 230 V, 50 Hz: L LINE (QP and AV margin ≥ 3.5 dB)

65-W ATQ GAN USB PD dual-C power charger and adaptor solution demo board (REF_65W_2C_GAN_PAG1) test report

Power management test results



Figure 33 CE at 230 V, 50 Hz: N LINE (QP and AV margin ≥ 3.9 dB)

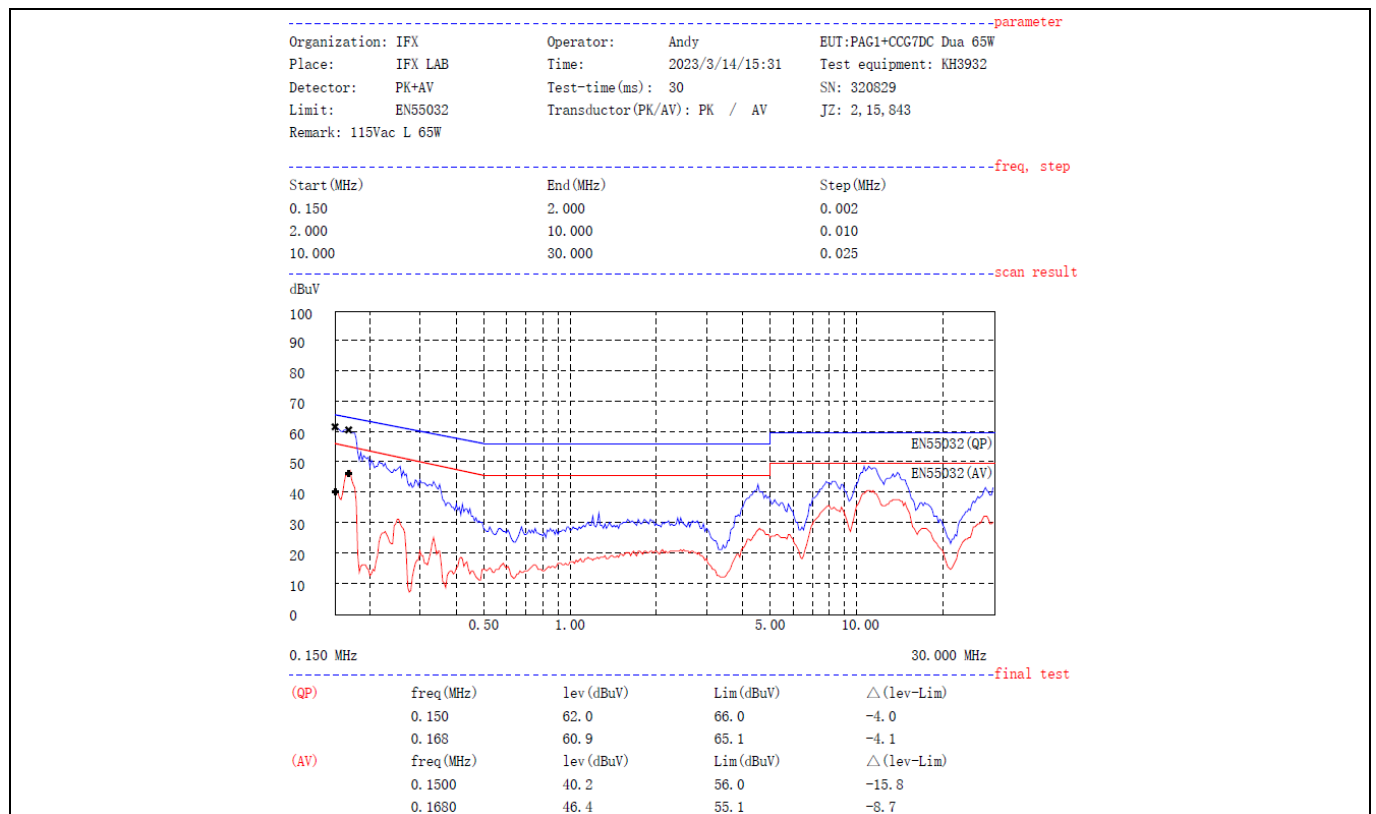


Figure 34 CE at 115 V, 60 Hz: L LINE (QP and AV margin ≥ 4 dB)

65-W ATQ GAN USB PD dual-C power charger and adaptor solution demo board (REF_65W_2C_GAN_PAG1) test report

Power management test results

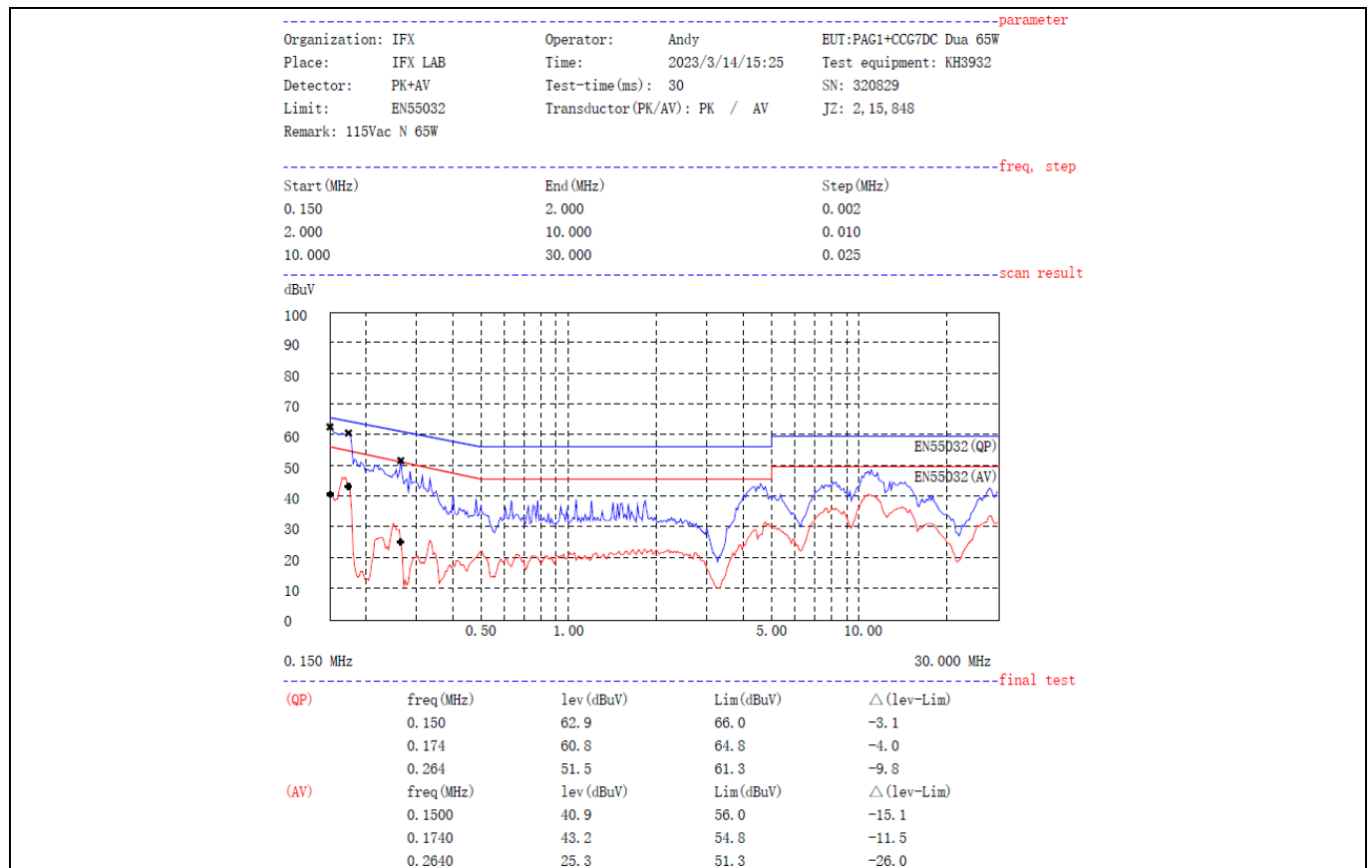


Figure 35 CE at 115 V, 60 Hz: N LINE (QP and AV margin ≥ 3.1 dB)

65-W ATQ GAN USB PD dual-C power charger and adaptor solution demo board (REF_65W_2C_GAN_PAG1) test report

Power management test results

3.16 Surge test



Issue No.: FM-SZM-018A
Issue Date: Jan.11,2016

WORKSHEET: Surge Test (EN 61000-4-5)

Test data: 2023.4.26
Applicant: Infineon Semiconductors (Shenzhen)
Model No:CCG7DC dual C ATQ GAN 65W charger 1# without MOV,2# with MOV

Environmental conditions					
Air Temperature (°C)	24	Relative Humidity (%RH)	56	Air Pressure (mBar)	1005

Test Equipment	
Ultra Compact Simulator; Coupling/Decoupling Network	

Set-Up EUT for Compliance Test

Test Requirement Standard	EN 55035:2017
Operating mode during test	A:230Vac 50Hz B:115Vac 60Hz
Detail EUT monitor system	Communication status, work status, display

Compliance-Test Record 1# without MOV

Compliance Test On AC Port						
Test (L-N)	level (kV)	Phase (deg)	Test mode	Surge Interval	number of surge impulses	Observations
L-N	+ 1	90°	All mode	60S	5	No Loss of function
L-N	- 1	270°	All mode	60S	5	No Loss of function

Test Conclusion and Reason

Test Conclusion: **Pass**
Reason (explain why?): Refer to above all
Performance Criterion: A



Issue No.: FM-SZM-018A
Issue Date: Jan.11,2016

Compliance-Test Record 2# with MOV

Compliance Test On AC Port						
Test (L-N)	level (kV)	Phase (deg)	Test mode	Surge Interval	number of surge impulses	Observations
L-N	+ 2	90°	All mode	60S	5	No Loss of function
L-N	- 2	270°	All mode	60S	5	No Loss of function

Test Conclusion and Reason

Test Conclusion: **Pass**
Reason (explain why?): Refer to above all
Performance Criterion: A

Figure 36 Surge test

65-W ATQ GAN USB PD dual-C power charger and adaptor solution demo board (REF_65W_2C_GAN_PAG1) test report



Power management test results

3.17 ESD test



Issue No.: FM-SZM-006A
Issue Date: Jan.11,2016

WORKSHEET: ESD Test (EN 61000-4-2)

Test date: 26/Apr/22

Application: Infineon(英飞凌)

Model No:CCG7DC dual C ATQ GAN 65W charger

Environmental conditions					
Air Temperature (°C)	21.6	Relative Humidity (%RH)	45.1	Air Pressure (mbar)	1015

Test Equipment	
Teseq AG (NSG437)	

Set-Up EUT for Compliance Test

Test Requirement Standard	As client's requirement	Set up the EUT as
		Table top
Operating mode during test	00 :115Vac 60Hz 01 :230Vac 50Hz	
Detail EUT monitor system	Work status	

Compliance-Test Record CCG7DC dual C ATQ GAN 65W charger(without case)

1 HCP / VCP contact discharge: (1 pulse / second)

EUT mode / Position	Level	HCP / VCP	Observation
All mode	± 4kV	VCP/HCP	No loss of function

Test Conclusion and Reason

Test Conclusion	PASS
Reason (explain why?)	Refer to above
Actual Performance Class:	A

Figure 37 ESD test

3.18 USB PD source test results (using Quadramax)

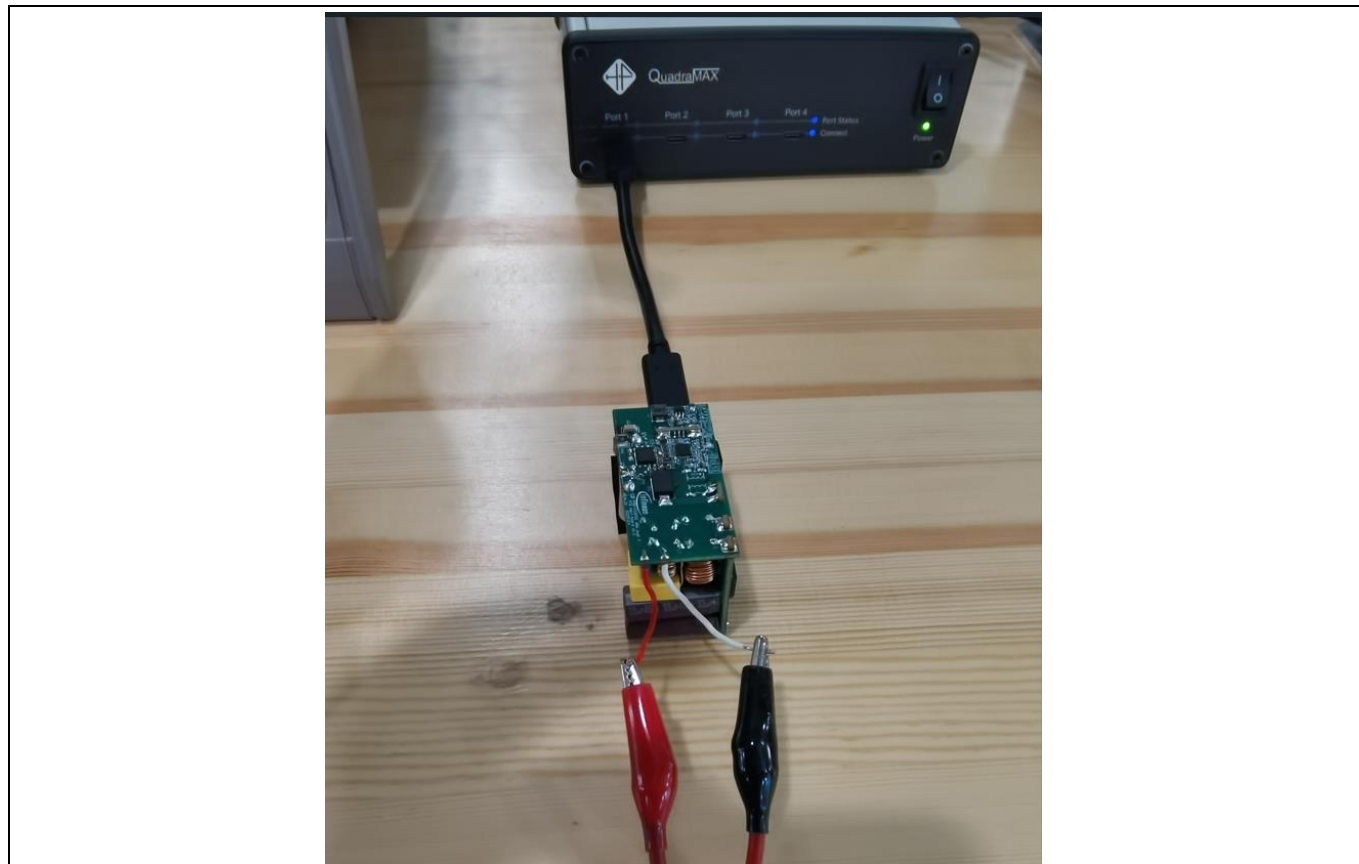


Figure 38 Test setup for Quadramax

Test results:

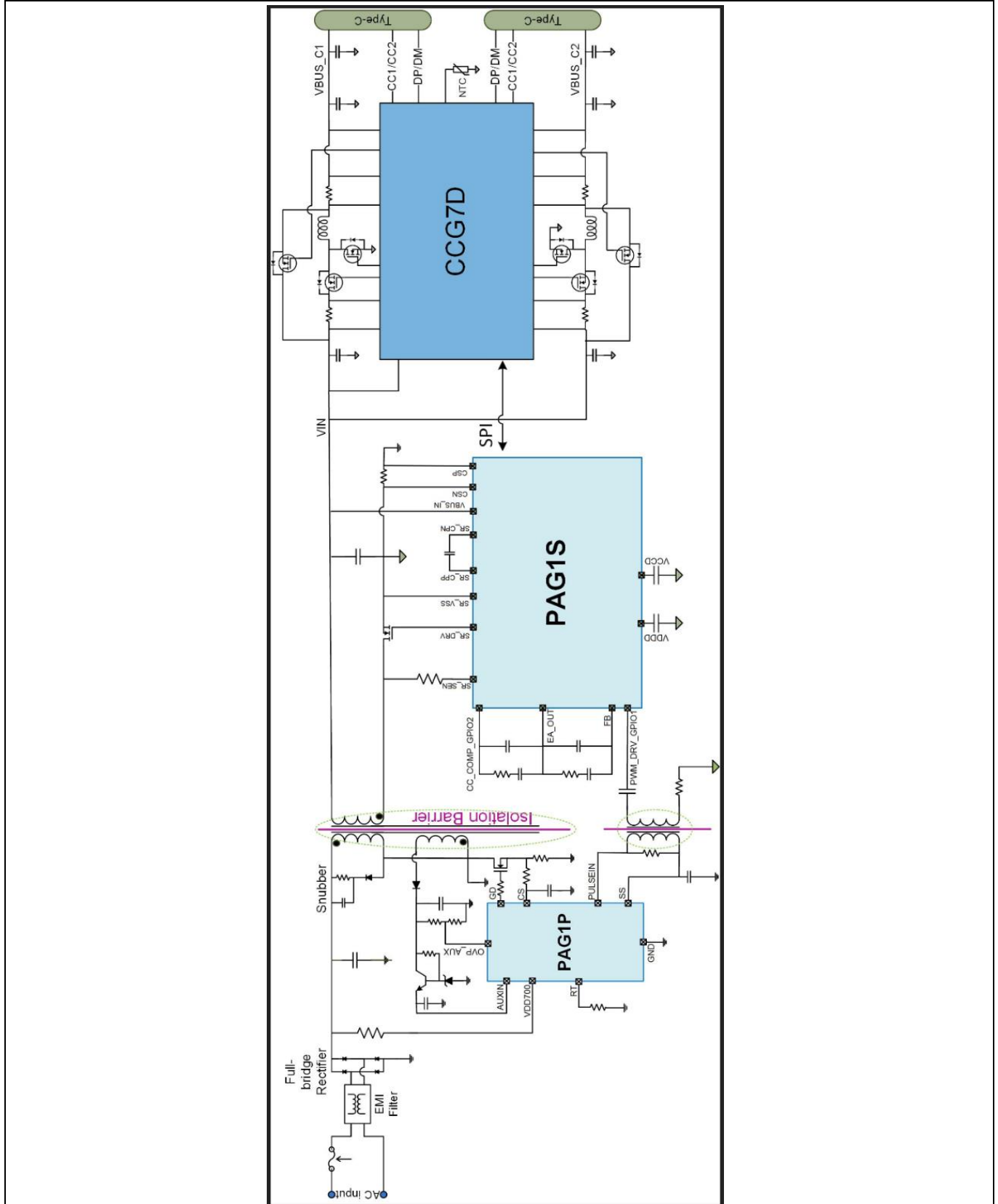
- Testing initialized
- 2021/6/25 17:12:32
- QuadDraw version: 0.8.7285
- QM#103 HWRev:1.4.4 FWST:0.0.1376 FWCCG1:0.10
- AC 115 V and 230 V input

Table 9 USB PD source test results (using Quadramax)

Test	Description	Result
TD SPT.1	Load test	PASS
TD SPT.2	Capabilities test	PASS
TD SPT.3	Hard reset test	PASS
TD SPT.5	Overcurrent test	PASS
TD SPT.6	PPS voltage step test	PASS
TD SPT.7	PPS current limit test	PASS

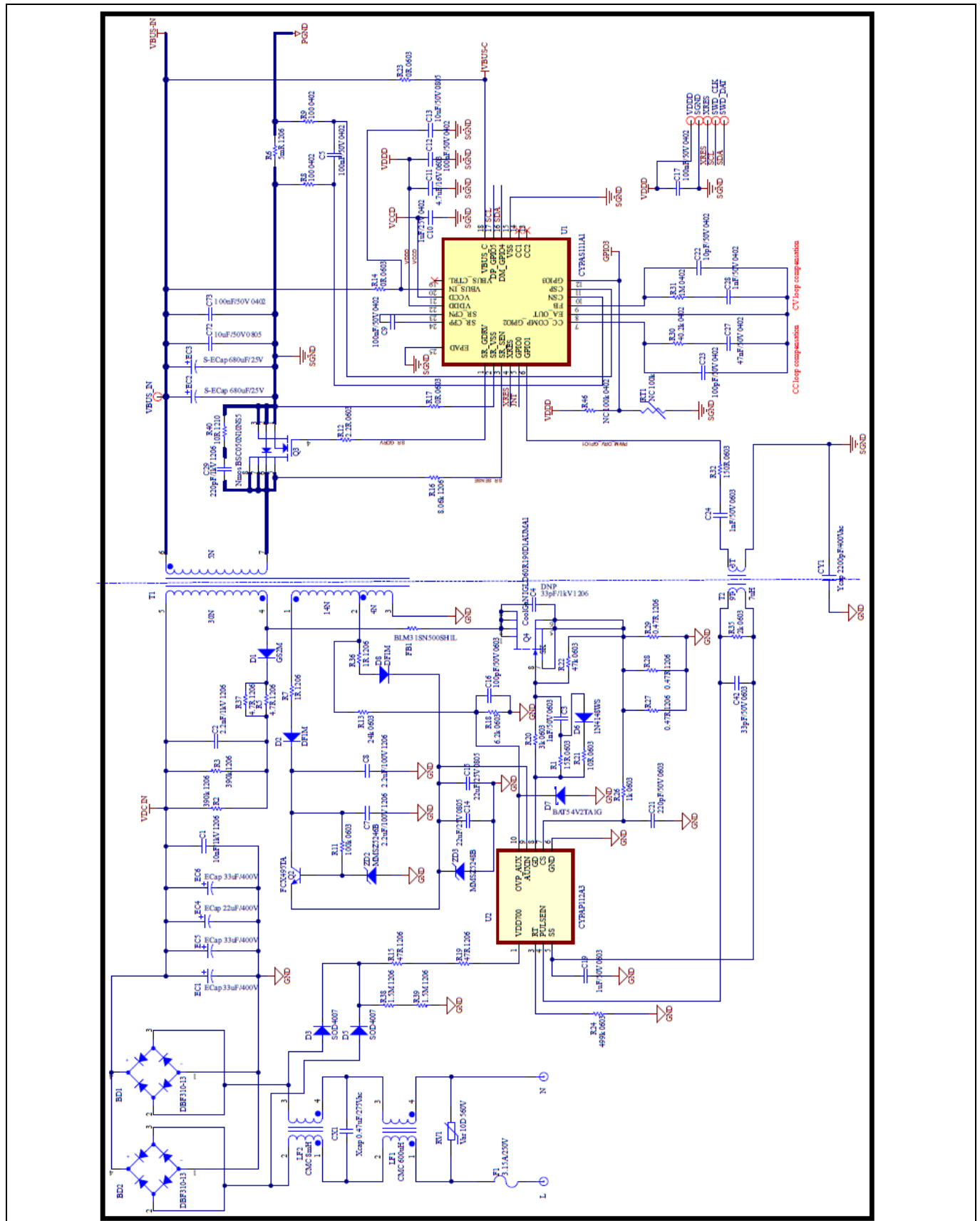
4 Appendix

4.1 Schematics



65-W ATQ GAN USB PD dual-C power charger and adaptor solution demo board (REF_65W_2C_GAN_PAG1) test report

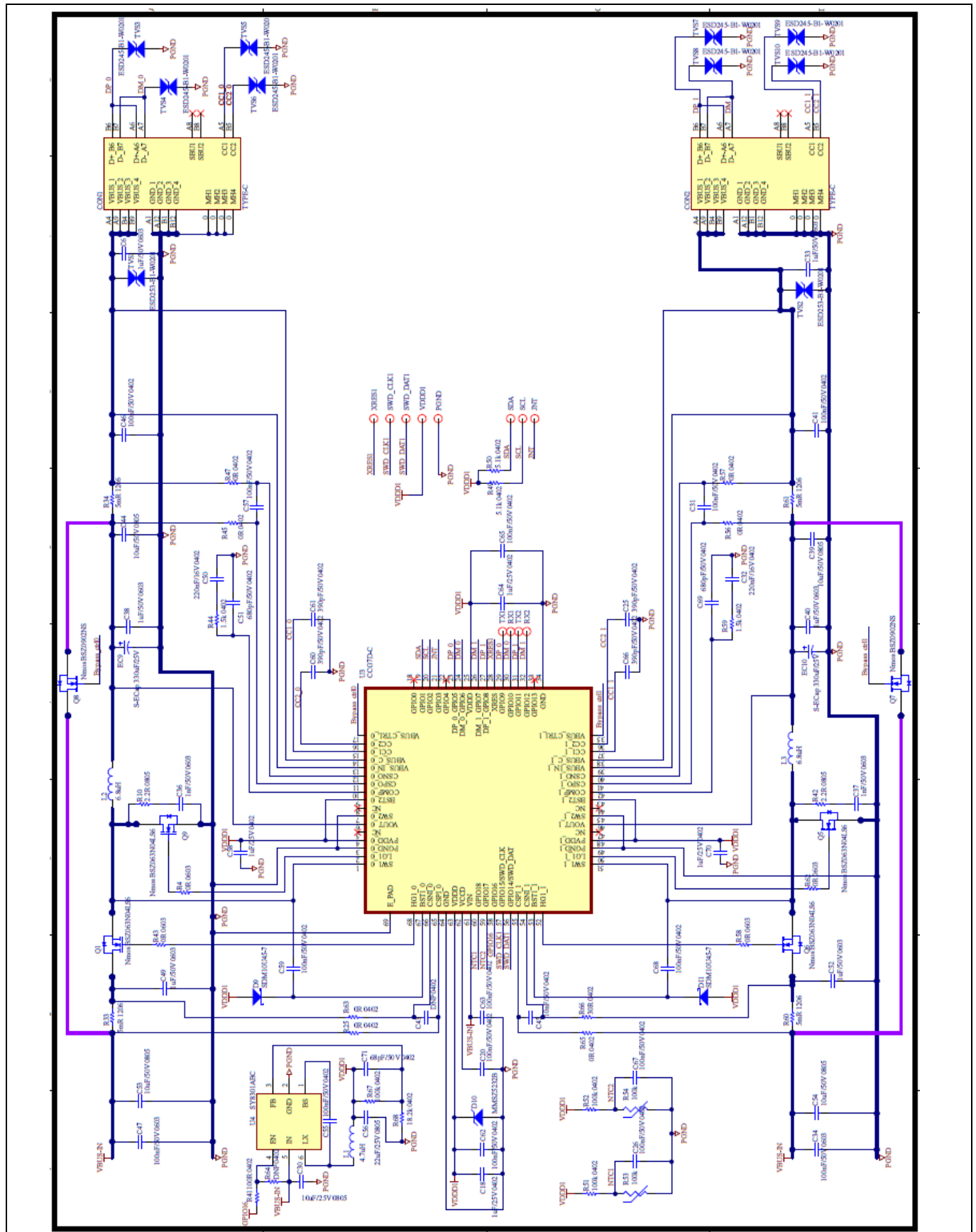
Appendix



65-W ATQ GAN USB PD dual-C power charger and adaptor solution demo board (REF_65W_2C_GAN_PAG1) test report



Appendix



65-W ATQ GAN USB PD dual-C power charger and adaptor solution demo board (REF_65W_2C_GAN_PAG1) test report



Appendix

4.2 Bill of materials

Comment	Description	Designator	Footprint	LibRef	Quantity
MLCC 0402 100nF	MLCC 100nF/50V X7R 0402 ±10%	C5, C9, C12, C17, C55, C73	0402_C	MLCC 0402 100nF_1	6
MLCC 0402 1uF	MLCC 1uF/25V X5R 0402 ±10%	C10	0402_C	MLCC 0402 1uF	1
MLCC 0603 4.7uF	MLCC 4.7uF/16V X7R 0603 ±10%	C11	0603_C	MLCC 0603 4.7uF	1
MLCC 0805 10uF	MLCC 10uF/50V X5R 0805 ±10%	C13, C30, C72	0805_C	MLCC 0805 10uF	3
MLCC 0402 10pF	MLCC 10pF/50V 0402 NPO ±5%	C22	0402_C	MLCC 0402 10pF	1
MLCC 0402 100pF	MLCC 100pF/50V NPO 0402 ±5%	C23	0402_C	MLCC 0402 100pF	1
MLCC 0603 1nF	MLCC 1nF/50V NPO 0603 ±10%	C24	0603_C	MLCC 0603 1nF	1
MLCC 0402 47nF	MLCC 47nF/50V X7R 0402 ±10%	C27	0402_C	MLCC 0402 47nF_1	1
MLCC 0402 1nF	MLCC 1nF/50V 0402 NPO ±5%	C28	0402_C	MLCC 0402 1nF_1	1
MLCC 1206 330pF	MLCC 330PF/1000V X7R 1206 ±10%	C29	1206_C	MLCC 1206 330pF	1
MLCC 0805 22uF	MLCC 22uF/25V X7R 0805 ±10%	C56	0805_C	MLCC 0805 22uF	1
MLCC 0402 68pF	MLCC 68pF/50V 0402 NPO ±5%	C71	0402_C	MLCC 0402 68pF	1
XCap 0.47uF/275Vac	X Cap 0.47uF/275Vac	CX1	CX W18*T6*P15	XCap 0.47uF/275Vac	1
Ycap 2200pF/400Vac	YCap 400V 2200PF Z5U Or Y5P	CY1	SMD 2.2nF Ycap	Ycap 2200pF/400Vac	1
S-ECap 680uF/25V	Solid Electrolytic Capacitor 680uF/25V	EC2, EC3	CE6.3/2.54(H14)	S-ECap 680uF/25V_1	2
Fuse 3.15A/250V	FUSE BRD MNT 3.15A 250VAC RADIAL	F1	fuse1	Fuse 3.15A/250V	1
4.7uH	Power inductor LQM2HPN4R7MG0L 4.7uH 20% 138mΩ 1.1A	L1	SMD 4.7uH 4.4*4.2	4.7uH	1
		L, N	Bivet Big Hole	TEST_POINT	2
CMC 600uH	CMC 600uH T9*3*3	LF1	9*5*3	CMC 600uH	1
CMC 8mH	CMC 8mH T12.7*8*5	LF2	TD15 20*11	CMC 8mH	1
Nmos BSC050N10NS5	Nmos BSC050N10NS5 100V 5mR 61A PG-TDSON-8	Q3	DFN5X6	Nmos BSC050N10NS5	1
R1206 0.005Ω	Resistor 0.005Ω 1206 1% 1/4W	R6	1206_R	R1206 0.005Ω	1
R0402 100Ω	Resistor 100Ω 0402 1% 1/16W	R8, R9, R41	0402_R	R0402 100Ω	3
R0603 2.2Ω	Resistor 2.2Ω 0603 1% 1/10W	R12	0603_R	R0603 2.2Ω	1
R0603 0Ω	Resistor 0Ω 0603 1% 1/10W	R14	0603_R	R0603 0Ω	1
R1206 8.06kΩ	Resistor 8.06kΩ 1206 1% 1/4W	R16	1206_R	R1206 8.06kΩ	1
R0402 40.2kΩ	Resistor 40.2kΩ 0402 1% 1/16W	R30	0402_R	R0402 40.2kΩ	1
R0402 1MΩ	Resistor 1MΩ 0402 1% 1/16W	R31	0402_R	R0402 1MΩ	1
R0603 150Ω	Resistor 150Ω 0603 1% 1/10W	R32	0603_R	R0603 150Ω	1
R1210 10Ω	Resistor 10Ω 1210 1% 1/3W	R40	1210-R	R1210 10Ω	1
R0402 100kΩ	Resistor 100kΩ 0402 1% 1/16W, 100 kOhms ±1% 0.063W, 1/16W Chip Resistor 0402 (1005 Metric) Thick Film	R46, R67	0402_R	R0402 100kΩ	2
DNP	Resistor DNP 0402 1% 1/16W	R64	0402_R	R0402 DNP	1
R0402 18.2kΩ	Resistor 18.2kΩ 0402 1% 1/16W	R68	0402_R	R0402 18.2kΩ	1
Ntc 100k	100k Thermistor 0402	RT1	0402_R	Ntc 100k	1
Var 10D 560V	Varistor 10D 560V	RV1	MOV10D471	Var 10D561	1
TEST POINT	Test point	SGND, SWD_CLK, SWD_DAT, VBUS_IN, VDDD, XRES	Test point	TEST POINT	6
Pulse Transformer 7uH	7uH 9T:3T 8mm	T2	Pulse Transformer-DIP	Pulse Transformer	1
CYPAS111A1	PAG1S PWM+PD+SR Controller QFN-24	U1	QFN-24_4x4x05P	CYPAS111A1	1
SY8301ABC	SY8301ABC High Efficiency, 1A 4.5v~40V Input Synchronous Step Down Regulator SOT-23 (6)	U4	SOT-23-6	SY8301ABC	1

Figure 39 Main board BOM

65-W ATQ GAN USB PD dual-C power charger and adaptor solution demo board (REF_65W_2C_GAN_PAG1) test report



Appendix

Comment	Description	Designator	Footprint	LibRef	Quantity
DBF310-13	Bridge Rectifier DBF310-13 3A 1000V 0.95V@1.5A	BD1, BD2	BD(DB106)	BD DBF310-13	2
MLCC 1206 10nF	MLCC 10nF/1000V X7R 1206 ±10%	C1	1206_C	MLCC 1206 10nF	1
MLCC 1206 2.2nF	MLCC 2.2nF/1000V X7R 1206 ±10%	C2	1206_C	MLCC 1206 2.2nF	1
MLCC 0603 1nF	MLCC 1nF/50V NPO 0603 ±10%	C3	0603_C	MLCC 0603 1nF	1
DNP	MLCC 33pF/1000V X7R 1206 ±10%	C4	1206_C	MLCC 1206 33pF	1
MLCC 1206 2.2uF	MLCC 2.2uF/100V X7R 1206 ±10%	C7, C8	1206_C	MLCC 1206 2.2uF	2
MLCC 0805 22uF	MLCC 22uF/25V X7R 0805 ±10%	C14, C15	0805_C	MLCC 0805 22uF	2
MLCC 0603 100pF	MLCC 100pF/50V X7R 0603 ±10%	C16	0603_C	MLCC 0603 100pF	1
MLCC 0603 1uF	MLCC 1uF/50V X7R 0603 ±10%	C19	0603_C	MLCC 0603 1uF	1
MLCC 0603 220pF	MLCC 220pF/50V X7R 0603 ±10%	C21	0603_C	MLCC 0603 220pF	1
MLCC 0603 33pF	MLCC 33pF/50V NPO 0603 ±1%	C42	0603_C	MLCC 0603 33pF	1
GS2M	Diode GS2M 2A/1000V SMA	D1	SMA	GS2M	1
DF1M	Diode DF1M 1A 1000V SOD-123	D2, D8	SOD-123F L2.8-W1.8-LS3.7-RD	DF1M	2
SOD4007	Diode SOD4007 SOD-123	D3, D5	SOD-123F L2.8-W1.8-LS3.7-RD	SOD4007	2
1N4148WS	Diode 1N4148WS SOD-323	D6	SOD-323	Diode 1N4148WS	1
BAT54V2TA1G	Schottky Diode BAT54V2TA1G SOD523	D7	SOD-123	Diode BAT54V2TA1G	1
ECap 33uF/400V	Electrolytic Capacitor 33uF/400V	EC1, EC5, EC6	CE8/3.5(H25)	ECap 33uF/400V	3
ECap 22uF/400V	Electrolytic Capacitor 22uF/400V	EC4	CE8/3.5(H19)	ECap 22uF/400V	1
BLM31SN500SH1L	Bead 50±12.5Ω @ 100Mhz, 12A, 1.6mQ 1206	FB1	1206_R	Bead 50Ω@100Mhz	1
FCX495TA	NPN Transistor FCX495TA 150V SOT-89-3	Q2	SOT89	FCX495TA	1
CoolGaN IGLD60R190D1AUMA1	CoolGaN IGLD60R190D1AUMA1 600V 190mQ 10A ThinPAK8x8	Q4	PG-LS0N-8-1	CoolGaN IGLD60R190D1AUMA	1
R0603 15Ω	Resistor 15Ω 0603 1% 1/10W	R1	0603_R	R0603 15Ω	1
R1206 390kΩ	Resistor 390kΩ 1206 1% 1/4W	R2, R3	1206_R	R1206 390kΩ	2
R1206 4.7Ω	Resistor 4.7Ω 1206 1% 1/4W	R5, R37	1206_R	R1206 4.7Ω	2
R1206 1Ω	Resistor 1Ω 1206 1% 1/4W	R7, R36	1206_R	R1206 1Ω	2
R0603 100kΩ	Resistor 100kΩ 0603 1% 1/10W	R11	0603_R	R0603 100kΩ	1
R0603 24kΩ	Resistor 24kΩ 0603 1% 1/10W	R13	0603_R	R0603 24kΩ	1
R1206 47Ω	Resistor 47Ω 1206 1% 1/4W	R15, R19	1206_R	R1206 47Ω	2
R0603 6.2kΩ	Resistor 6.2kΩ 0603 1% 1/10W	R18	0603_R	R0603 6.2kΩ	1
R0603 3kΩ	Resistor 3kΩ 0603 1% 1/10W	R20	0603_R	R0603 3kΩ	1
R0603 10Ω	Resistor 10Ω 0603 1% 1/10W	R21	0603_R	R0603 10Ω	1
R0603 47kΩ	Resistor 47kΩ 0603 1% 1/10W	R22	0603_R	R0603 47kΩ	1
R0603 499kΩ	Resistor 499kΩ 0603 1% 1/10W	R24	0603_R	R0603 499kΩ	1
R0603 1kΩ	Resistor 1kΩ 0603 1% 1/10W	R26	0603_R	R0603 1kΩ	1
R1206 0.47Ω	Resistor 0.47Ω 1206 1% 1/4W	R27, R28, R29	1206_R	R1206 0.47Ω	3
R0603 2kΩ	Resistor 2kΩ 0603 1% 1/10W	R35	0603_R	R0603 2kΩ	1
R1206 1.5MΩ	Resistor 1.5MΩ 1206 1% 1/4W	R38, R39	1206_R	R1206 1.5MΩ	2
Transformer	Transformer	T1	ATQ24 5PIN 2	ATQ24 5PIN 2	1
CYPAP112A3	PAG1P PWM Controller SOIC-10	U2	SOP-10	CYPAP112A3	1
MMSZ5246B	Zener MMSZ5246B 16V SOD-123	ZD2	SOD-123	Zener MMSZ5246B	1
MMSZ5248B	Zener MMSZ5248B 18V SOD-123	ZD3	SOD-123	Zener MMSZ5248B	1

Figure 40 Daughter board BOM

65-W ATQ GAN USB PD dual-C power charger and adaptor solution demo board (REF_65W_2C_GAN_PAG1) test report



Appendix

Comment	Description	Designator	Footprint	LibRef	Quantity
MLCC 0603 1uF	MLCC 1uF/50V X7R 0603 ±10%	C6, C33, C38, C40, C49, C52	0603_C	MLCC 0603 1uF	6
MLCC 0402 1uF	MLCC 1uF/25V X5R 0402 ±10%	C18, C58, C64, C70	0402_C	MLCC 0402 1uF	4
MLCC 0402 100nF	MLCC 100nF/50V X7R 0402 ±10%	C20, C26, C31, C41, C46, C57, C59, C62, C63, C65, C67, C68	0402_C	MLCC 0402 100nF_1	12
MLCC 0402 390pF	MLCC 390pF/50V X7R 0402 ±10%	C25, C60, C61, C66	0402_C	MLCC 0402 390pF	4
MLCC 0402 220nF	MLCC 220nF/16V X7R 0402 ±10%	C32, C50	0402_C	MLCC 0402 220nF	2
MLCC 0603 100nF	MLCC 100nF/50V X7R 0603 ±10%	C34, C47	0603_C	MLCC 0603 100nF	2
MLCC 0603 1nF	MLCC 1nF/50V NPO 0603 ±10%	C36, C37	0603_C	MLCC 0603 1nF	2
MLCC 0805 10uF	MLCC 10uF/50V X5R 0805 ±10%	C39, C44, C53, C54	0805_C	MLCC 0805 10uF_1	4
DNP	MLCC DNP 0402 ±10%	C43	0402_C	MLCC 0402 DNP	1
MLCC 0402 10nF	MLCC 10nF/50V 0402 X7R ±5%	C45	0402_C	MLCC 0402 10nF	1
MLCC 0402 680pF	MLCC 680pF/50V X7R 0402 ±10%	C51, C69	0402_C	MLCC 0402 680pF	2
TYPE-C	TYPE-C connector 16-pin	CON1, CON2	TYPE_C 16PIN_VERTICAL	TYPE-C connector_1	2
SDM10U45-7	Schottky SDM10U45-7 SOD-523	D9, D11	SOD-323	Schottky SDM10U45-7	2
MMSZ5232B	Zener MMSZ5232B 5.6V SOD-123	D10	SOD-123	Zener MMSZ5232B	1
S-ECap 330uF/25V	Solid Electrolytic Capacitor 330uF/25V	EC9, EC10	CE6.3/2.54(H9)	S-ECap 330uF/25V	2
TEST POINT	Test point	JNT, PGND, RX1, RX2, SCL, SDA, SWD_CLK1, SWD_DAT1, TX1, TX2, VDDDD1, XRES1	Test point	TEST POINT	12
22uH	Power inductor 22uH	L2, L3	INDUCTOR-H-13MM	22uH	2
Nmos BSZ063N04LS6	Nmos BSZ063N04LS6 40V 6.3mΩ 40A PG-TSDSON-8 3.3*3.3	Q1, Q5, Q6, Q9	PG-TSDSON-8_3.3*3.3	Nmos BSZ063N04LS6	4
Nmos BSZ0902NS	Nmos BSZ0902NS 30V 3.5mΩ 58A PG-TSDSON-8 3.3*3.3	Q7, Q8	PG-TSDSON-8_3.3*3.3	Nmos BSZ0902NS	2
R0603 0Ω	Resistor 0Ω 0603 1% 1/10W	R4, R43, R58, R62	0603_R	R0603 0Ω	4
R0805 2.2Ω	Resistor 2.2Ω 0805 1% 1/16W	R10, R42	0805_R	R0805 2.2Ω	2
R0402 0Ω	Resistor 0Ω 0402 1% 1/16W	R25, R45, R47, R56, R57, R63, R65	0402_R	R0402 0Ω	7
R1206 0.005Ω	Resistor 0.005Ω 1206 1% 1/4W	R33, R34, R60, R61	1206_R	R1206 0.005Ω	4
R0402 1.5kΩ	Resistor 1.5kΩ 0402 1% 1/16W	R44, R59	0402_R	R0402 1.5kΩ	2
R0402 5.1kΩ	Resistor 5.1kΩ 0402 1% 1/16W	R49, R50	0402_R	R0402 5.1kΩ	2
R0402 100kΩ	Resistor 100kΩ 0402 1% 1/16W	R51, R52	0402_R	R0402 100kΩ	2
Ntc 100k	100k Thermistor 0402	R53, R54	0402_R	Ntc 100k	2
R0402 30Ω	Resistor 30Ω 0402 1% 1/16W	R66	0402_R	R0402 30Ω	1
ESD253-B1-W0201	ESD protection ESD253-B1-W0201 V _{rw} =24V, V _c =31V, ±15 kV (air / contact discharge) 0201	TVS1, TVS2	WLL-2-3	TVS ESD253-B1-W0201	2
ESD245-B1-W0201	ESD protection ESD245-B1-W0201 V _c =7.5V ±18 kV (air), ±15 kV (contact discharge) 0201	TVS3, TVS4, TVS5, TVS6, TVS7, TVS8, TVS9, TVS10	WLL-2-3	TVS ESD245-B1-W0201	8
CYPD7271	CCG7D Dual-C PD and Buck-Boost Controller QFN68-10*10	U3	QFN-68_8*8(0.9mm)	CYPD7271	1

Figure 41 EZ-PD™ CCG7DC board BOM

Appendix

4.3 PCB layout

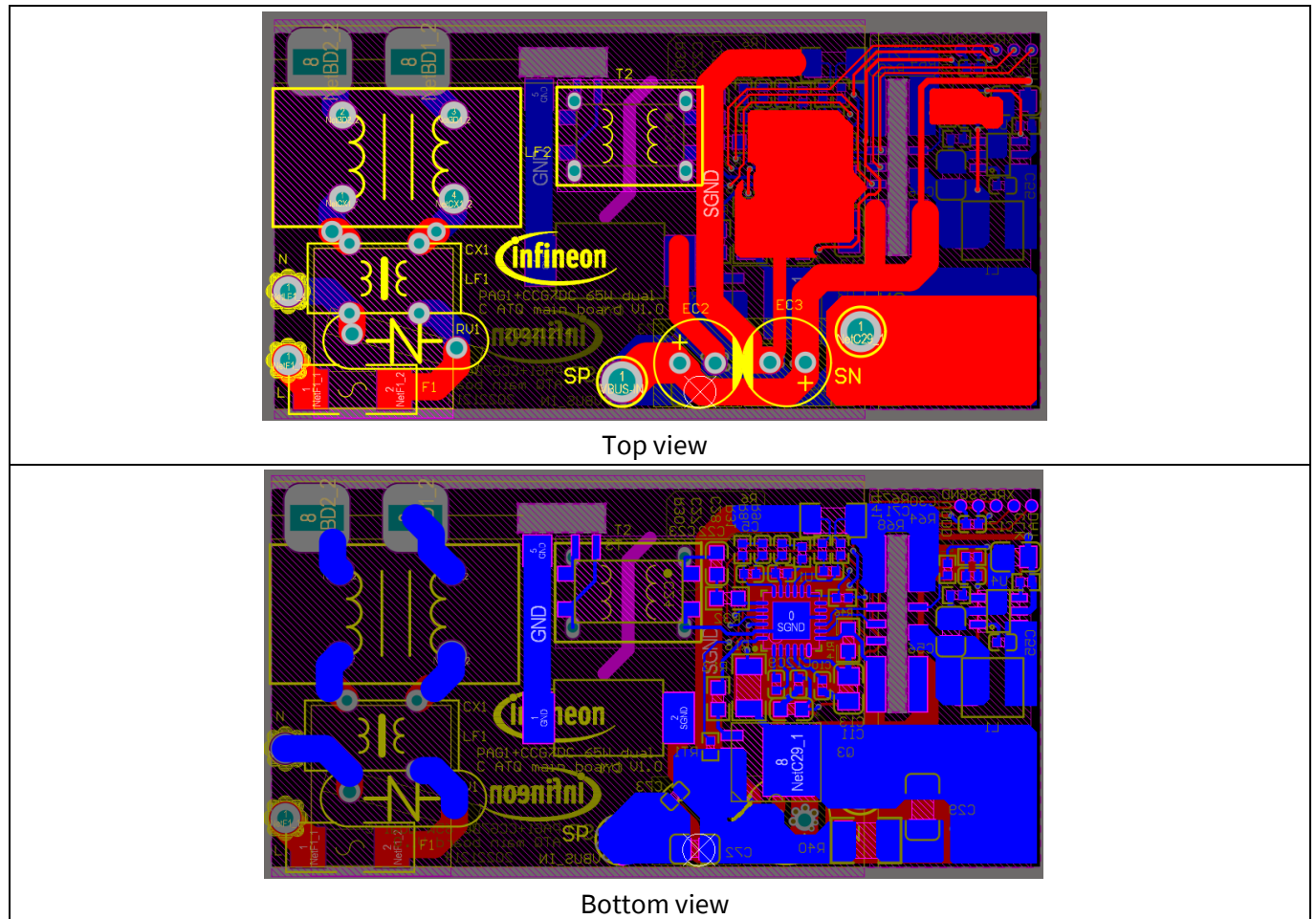


Figure 42 Main board

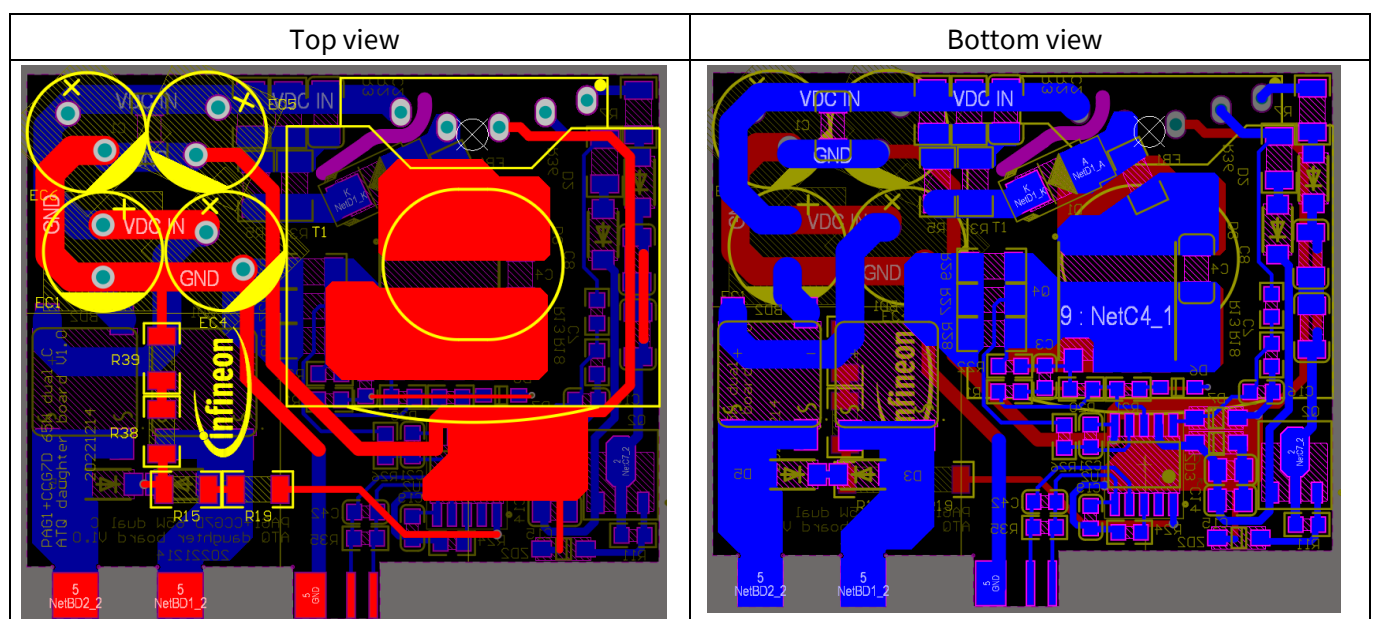


Figure 43 Daughter board

65-W ATQ GAN USB PD dual-C power charger and adaptor solution demo board (REF_65W_2C_GAN_PAG1) test report

Appendix

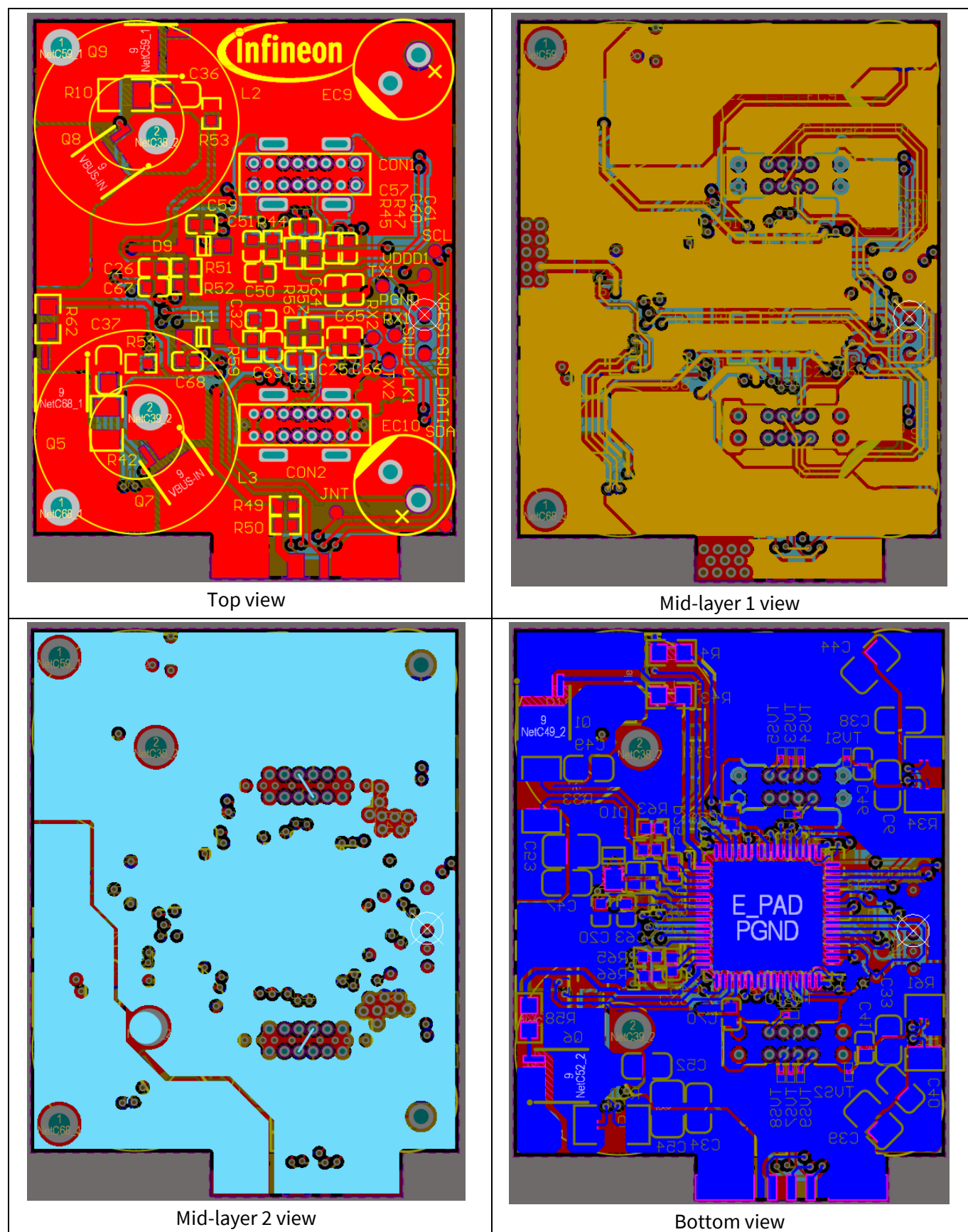


Figure 44 EZ-PD™ CCG7DC board

65-W ATQ GAN USB PD dual-C power charger and adaptor solution demo board (REF_65W_2C_GAN_PAG1) test report

Appendix

4.4 Transformer specifications (T1 ATQ23.7 DMR96 350 μ H)

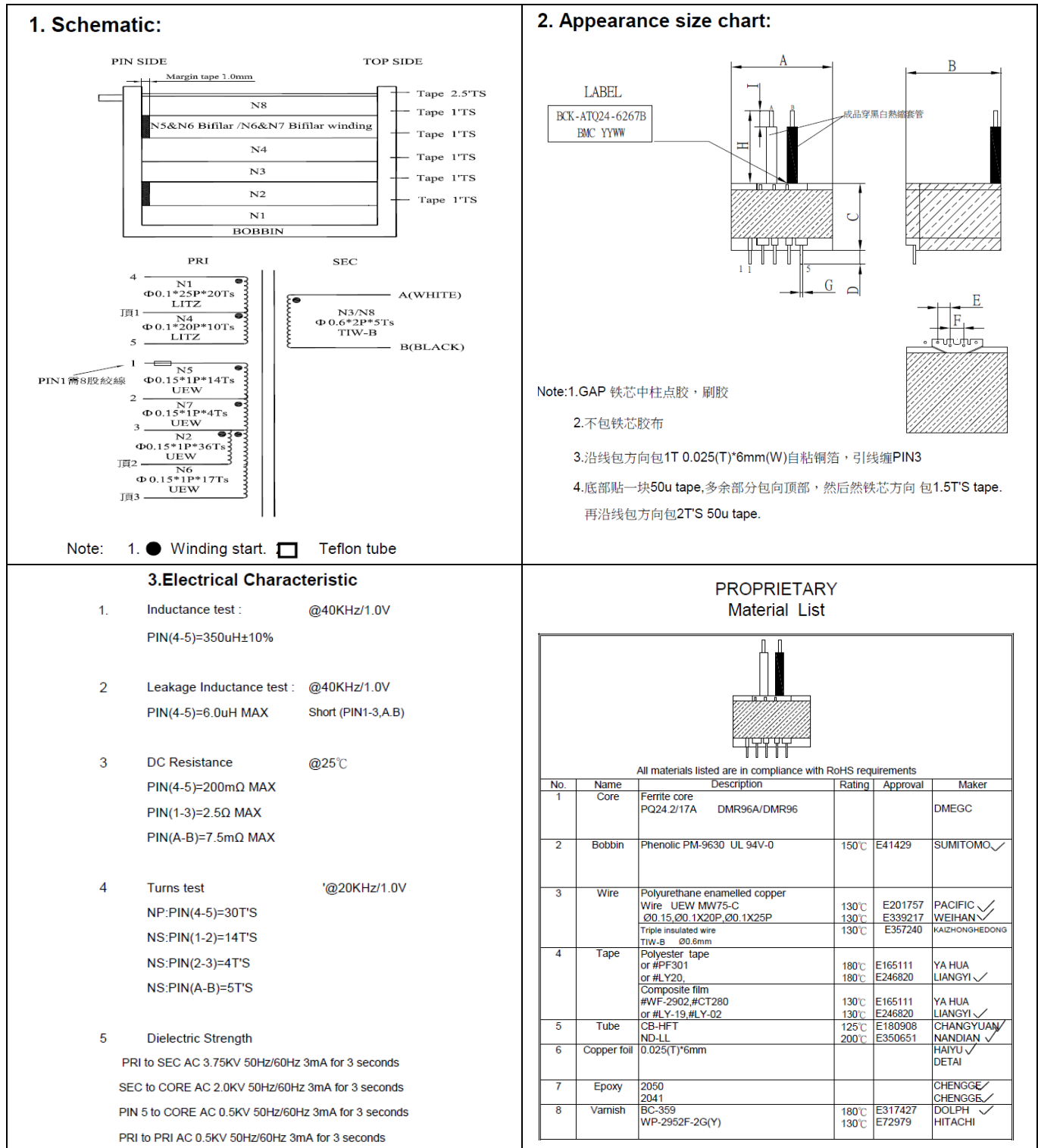


Figure 45 ATQ23.7 DMR96 transformer design spec

65-W ATQ GAN USB PD dual-C power charger and adaptor solution demo board (REF_65W_2C_GAN_PAG1) test report

Appendix

4.5 Common mode choke specifications (LF1 600 μ H, LF2 8 mH)

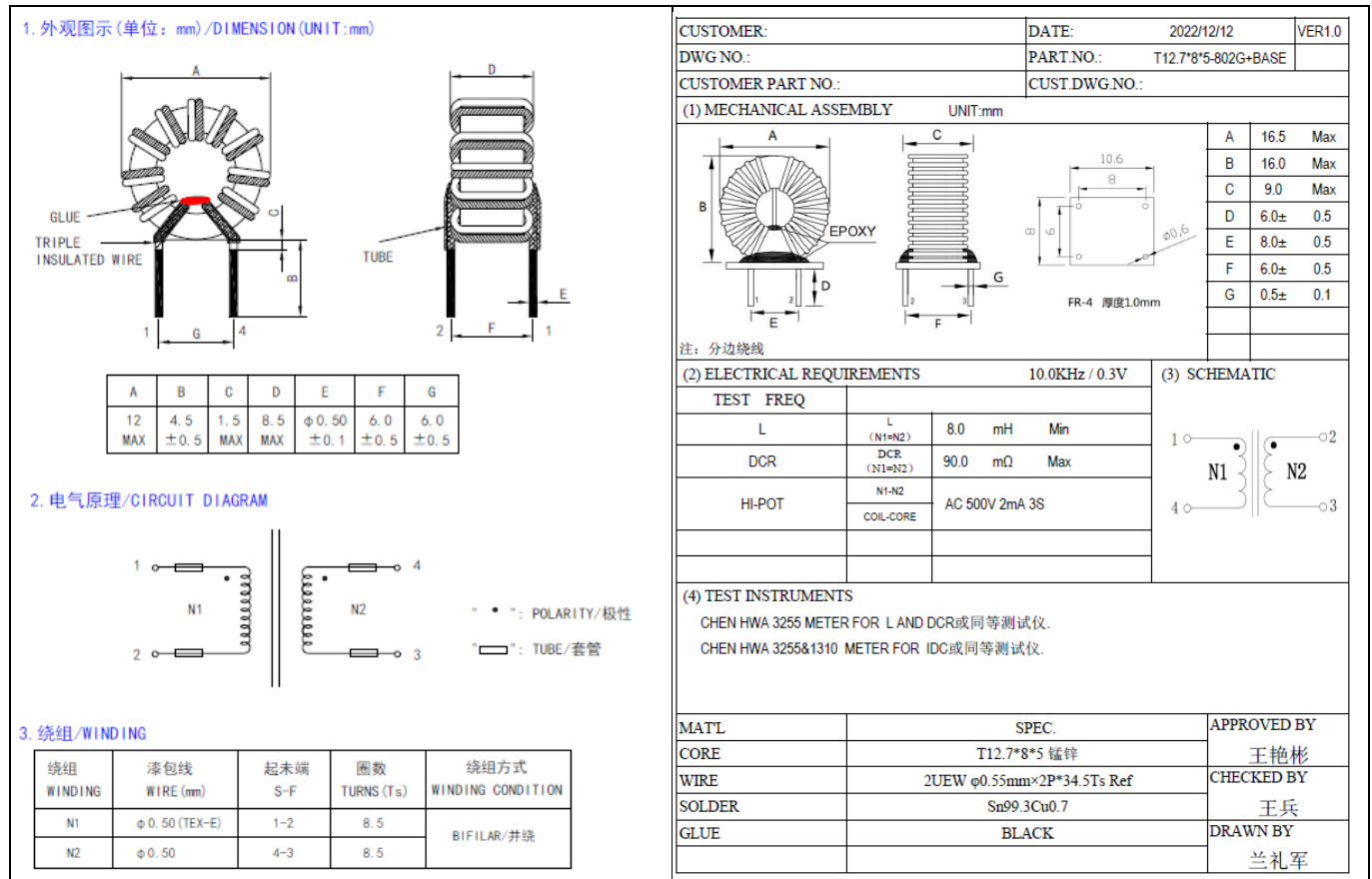
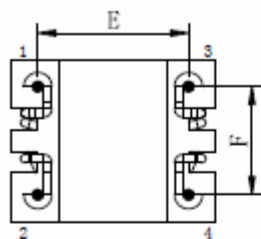


Figure 46 Common mode choke specification

Appendix

4.6 Pulse transformer (T2)

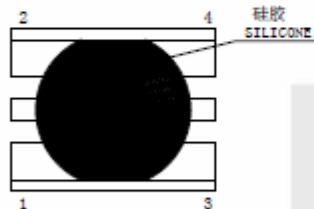
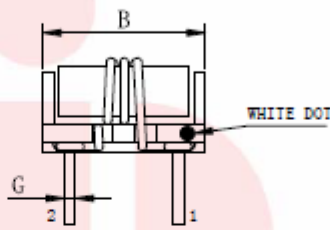
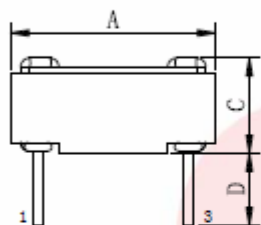
1. 外观图(单位:mm)/DIMENSION(UNIT:mm)



MARKING/LABEL:

LCL-T6-5138A				
PIN1	JQH	YY	WW	PIN3

组别/NO. (01, 02...)
周/WEEK (1, 01; 2, 02...)
年/YEAR (2018, 18; 2019, 19...)



NOTE:

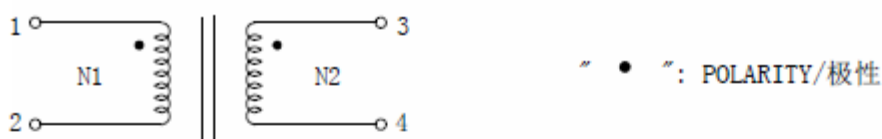
1. 线圈和磁环点胶将磁环全部封住。
2. PIN1打点标识。

A	B	C	D	E	F	G
10.4 MAX	8.0 MAX	6.0 MAX	3.5 ±0.3	8.0 ±0.15	5.0 ±0.15	Ø0.5 ±0.1

65-W ATQ GAN USB PD dual-C power charger and adaptor solution demo board (REF_65W_2C_GAN_PAG1) test report

Appendix

2. 电原理图/CIRCUIT DIAGRAM



3. 绕组/WINDING

绕组 WINDING	漆包线 WIRE (mm)	起末端 S-F	圈数 TURNS (Ts)	绕制方式 WINDING CONDITION
N1	φ 0.2mm*1P T. I. W	1-2	3	CLOSE/密绕
N2	φ 0.2mm*1P 2UEW-F	3-4	9	CLOSE/密绕

4. 电气特性/ELECTRICAL CHARACTERISTIC

序号 NO.	项目 ITEM	测量点 MEASURED POINT	技术要求 TECHNICAL DATA	测试条件及仪器 TESTING CONDITION & INSTRUMENT
1	电感量 INDUCTANCE	L (1-2)	7.0uH MIN	Agilent 4284A 100KHz/0.3V, AT 25°C
2	耐压 HI-POT	N1-N2	3.0KV AC	CS9929 50Hz/60Hz 4mA 4S

5. 材料清单/MATERIAL LIST

序号 NO.	材料名称 ITEM	规格 TYPE	供应商 SUPPLIERS	认证号 UL NO.
1	磁芯 CORE	TYPE:T6*4*2.15 R10K	HENGDIAN GROUP DMEGC MAGNETICS CO.,LTD ACME	N/A
2	底座 BASE	TYPE:Phenolic (PF) MATERIAL:PM-9820/PM-9630 THERMAL RATING:150°C	SUMITOMO BAKELITE CO LTD	E41429
3	三层绝缘线 TRIPLE INSULATED WIRE	TYPE: FIW TYPE: FIW THERMAL RATING:155°C	HOI LUEN ELECTRICAL MFR CO LTD TAI-I COPPER (GUANZHOU) CO LTD	E257525 E234896
4	漆包线 WIRE	MARK DSG:πUEW/155, QA-π/155 ANSI TYPE:MW 79-C THERMAL RATING:155°C	DONG GUAN YIDA INDUSTRIAL CO LTD	E344055
5	硅胶 SILICONE	TYPE:3140 THERMAL RATING:200°C	DOW CORNING CORPORATION	

注:产品符合RoHS要求.

Note: The products comply with RoHS requirements.

6. 产品单重/WEIGHT

Net Weight:***g/PC

Figure 47 Pulse transformer LCL-T6-5138A spec

65-W ATQ GAN USB PD dual-C power charger and adaptor solution demo board (REF_65W_2C_GAN_PAG1) test report

Appendix

4.7 EZ-PD™ Configuration Utility

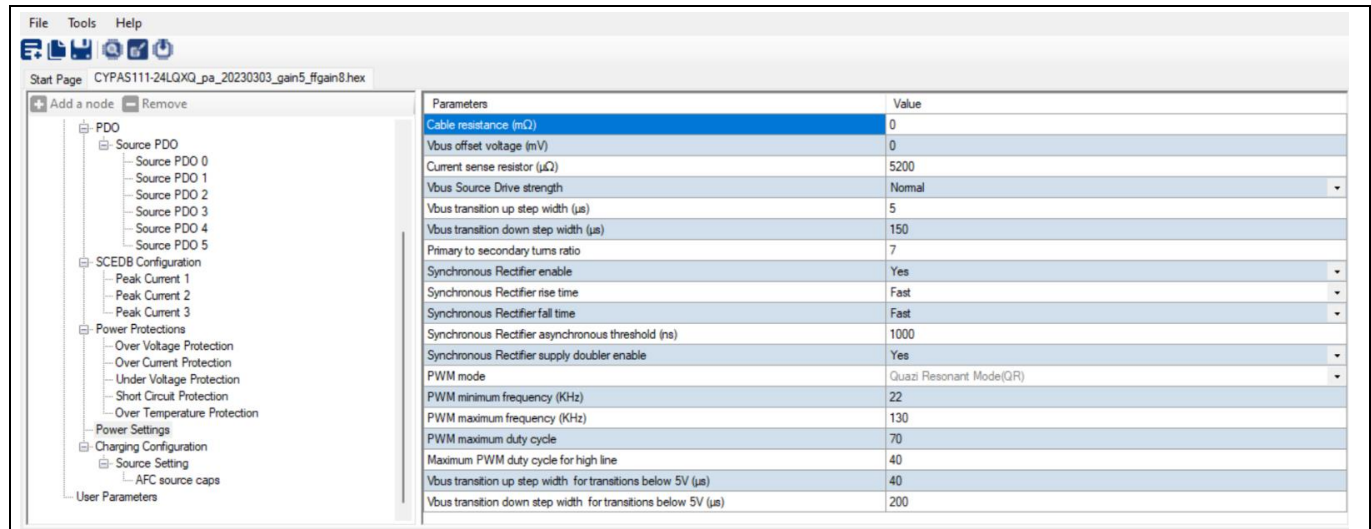


Figure 48 EZ-PD™ PAG1 Utility

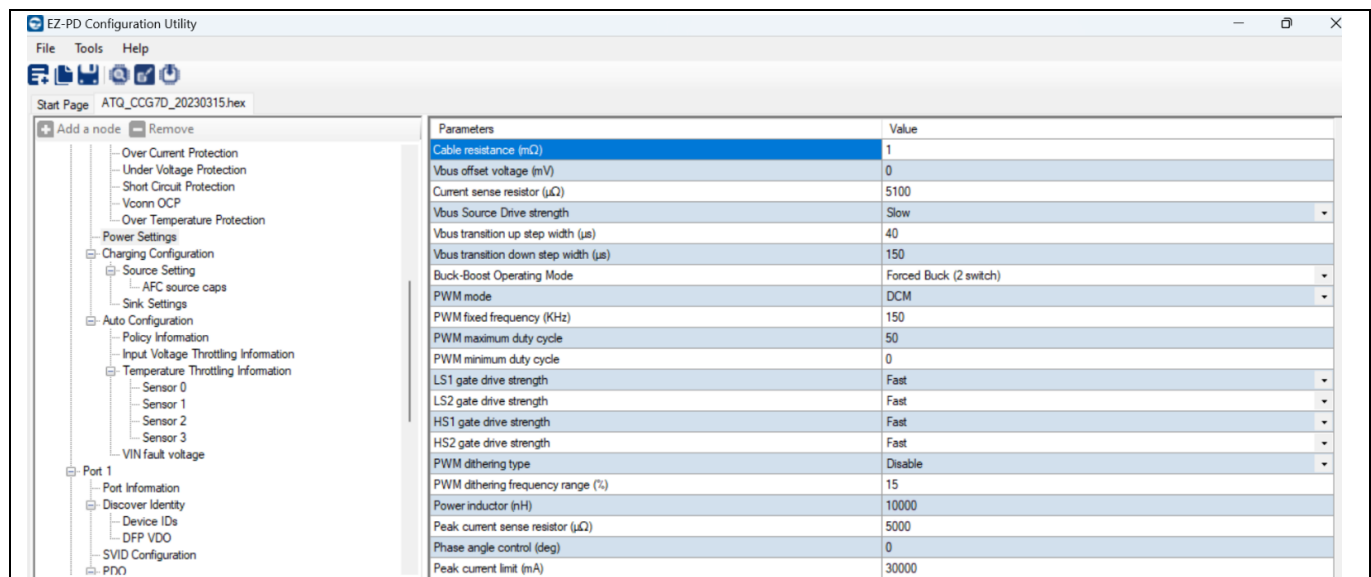


Figure 49 EZ-PD™ CCG7DC port1 Utility

65-W ATQ GAN USB PD dual-C power charger and adaptor solution demo board (REF_65W_2C_GAN_PAG1) test report

Appendix

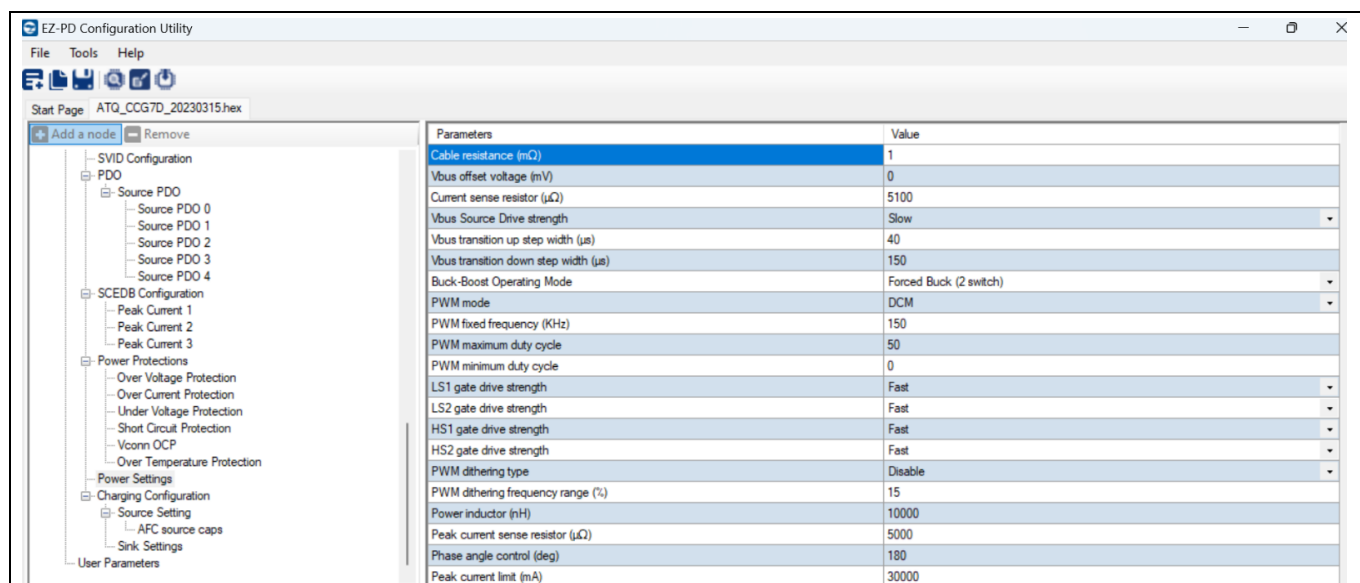


Figure 50 EZ-PD™ CCG7DC port2 Utility

The Infineon's EZ-PD™ PAG1S controller is a highly configurable and programmable solution. The chip can be configured using parameters stored in the internal flash memory. These parameters are to be chosen and programmed by Infineon's customers according to their use cases and requirements.

The Graphical User Interface (GUI) of EZ-PD™ Configuration Utility allows users to intuitively select and configure the parameters for their application.

Table 10 lists the default configured values with respect to power settings and power protections.

Table 10 Default configuration values

Parameters	Values
Power settings	
Cable resistance (mΩ)	0
Vbus offset voltage (mV)	0
Current Sense resistor (μΩ)	5200
Vbus Source Drive strength	Normal
Vbus transition up step width (μs)	5
Vbus transition down step width (μs)	150
Primary to secondary turns ratio	7
Synchronous Rectifier enable	Yes
Synchronous Rectifier rise time	Fast
Synchronous Rectifier fall time	Fast
Synchronous Rectifier async threshold (ns)	1000
Synchronous Rectifier doubler enable	Yes
PWM mode	Quasi Resonant Mode (QR)
PWM minimum frequency (kHz)	22
PWM maximum frequency (kHz)	130
PWM maximum duty cycle (%)	70

65-W ATQ GAN USB PD dual-C power charger and adaptor solution demo board (REF_65W_2C_GAN_PAG1) test report



Appendix

Parameters	Values
Power protections	
Overvoltage protection	
Enable	Yes
OVP threshold (%)	20
Debounce period (μs)	10
Retry count	2
Overcurrent protection	
Enable	Yes
OCP threshold (%)	20
Debounce period (ms)	10
Retry count	2
Undervoltage protection	
Enable	Yes
UVP threshold (%)	70
Debounce period (μs)	10
Retry count	2
Short-circuit protection	
Enable	NO
Debounce period (μs)	4
Retry count	2
Overtemperature protection	
Enable	Yes
Thermistor type 1	NTC
Cutoff value 1	4800
Restart value 1	4650
Debounce period (ms)	10
Enable thermistor 2	NO
Thermistor type 2	0
Cutoff value 2	0
Restart value 2	0

Revision history

Revision history

Document revision	Date	Description of changes
**	2023-08-04	Initial release.
*A	2023-09-08	Minor formatting changes in the document

Trademarks

All referenced product or service names and trademarks are the property of their respective owners.

Edition 2023-09-08

Published by

Infineon Technologies AG

81726 Munich, Germany

**© 2023 Infineon Technologies AG.
All Rights Reserved.**

Do you have a question about this document?

Email: erratum@infineon.com

Document reference

002-38430 Rev. *A

Important notice

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics ("Beschaffenhheitsgarantie")

With respect to any examples, hints or any typical values stated herein and/or any information regarding the application of the product, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation warranties of non-infringement of intellectual property rights of any third party.

In addition, any information given in this document is subject to customer's compliance with its obligations stated in this document and any applicable legal requirements, norms and standards concerning customer's products and any use of the product of Infineon Technologies in customer's applications.

The data contained in this document is exclusively intended for technically trained staff. It is the responsibility of customer's technical departments to evaluate the suitability of the product for the intended application and the completeness of the product information given in this document with respect to such application.

Warnings

Due to technical requirements products may contain dangerous substances. For information on the types in question please contact your nearest Infineon Technologies office.

Except as otherwise explicitly approved by Infineon Technologies in a written document signed by authorized representatives of Infineon Technologies, Infineon Technologies' products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury.