

## Report Details

Products tested	VCCR300-xx
Products Description	300W DC-DC power supply.
Design Phase	3 – Verification
Product Serials	P/N: VCCR300-24, S/N: 2328CXX0004 P/N: VCCR300-36, S/N: 2328CXX0006
Test Goals	Test according to MIL-STD-810G: Method 503.5 Procedure I-C
Test dates	13 <sup>th</sup> July to 9 <sup>th</sup> August 2023
Report date	14 <sup>th</sup> August 2023

## Authorisation

Jorge Almendros

14/8/23

Test performed by (Print)

Date

Brian McDonald

14/8/23

Test report written by (Print)

Date

# 1. Objective

Thermal Shock testing is an optional test requirement to comply with MIL-STD-810G standard. The objective of this report is to show compliance with the requirements of MIL-STD-810G: Method 503.5 Procedure I-C.

## 2. Executive summary

Performance tests were carried out on a number of product samples at the Vox Power R&D laboratory and the results recorded. The units were then shipped to a specialist external laboratory to perform the thermal shock test according to the relevant MIL-STD-810G standard. The samples were then returned to the Vox Power R&D laboratory and the performance tests were repeated and compared with the original results. A visual inspection was also carried out to ensure no mechanical damage had occurred during testing.

The details of the performance tests before and after testing are shown in appendix 1.

The details of the visual inspection are shown in appendix 2.

The details of the thermal shock testing are shown in appendix 3.

## 3. Conclusions

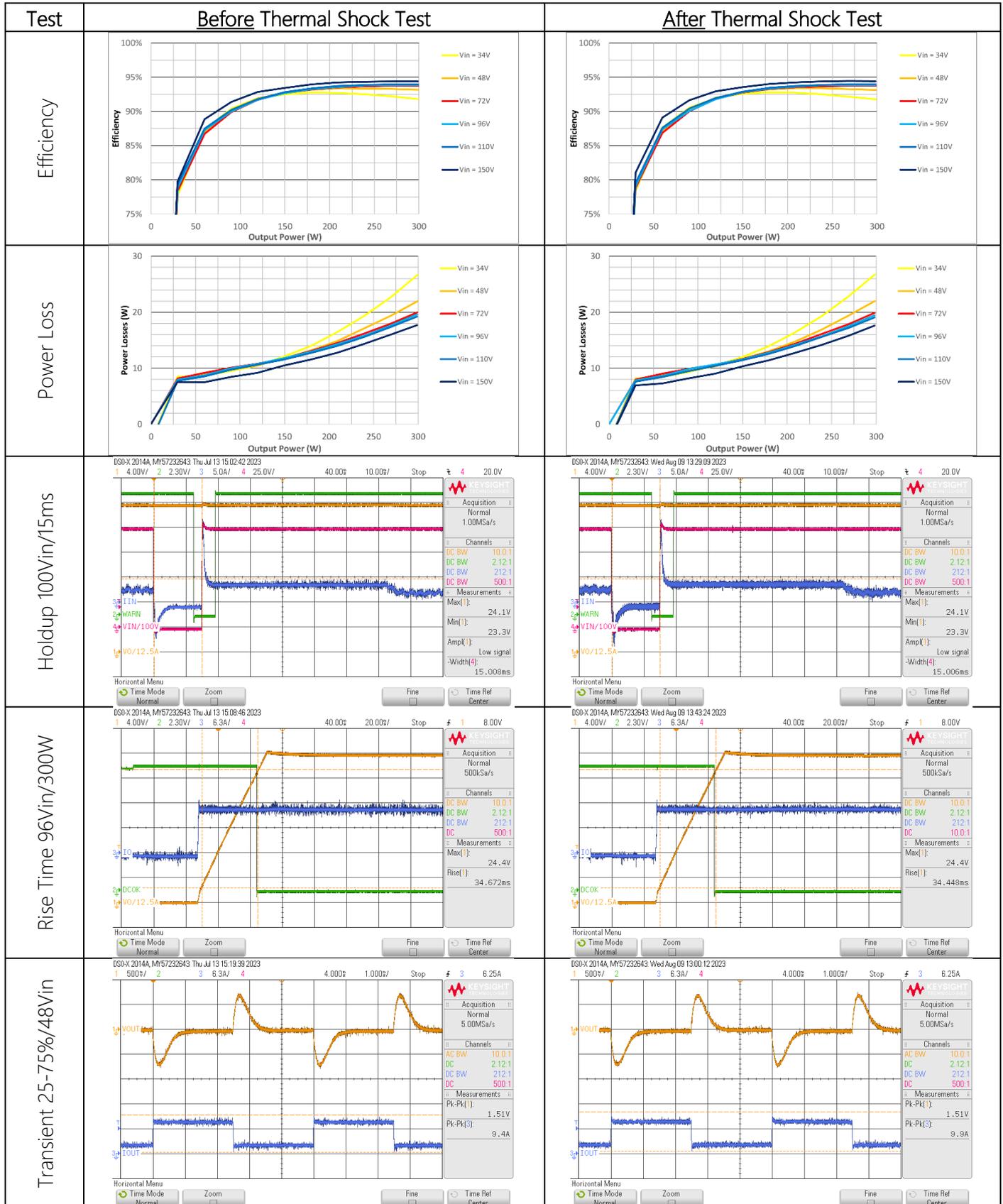
The performance test results for the tested samples before and after the thermal shock test show no variation in performance.

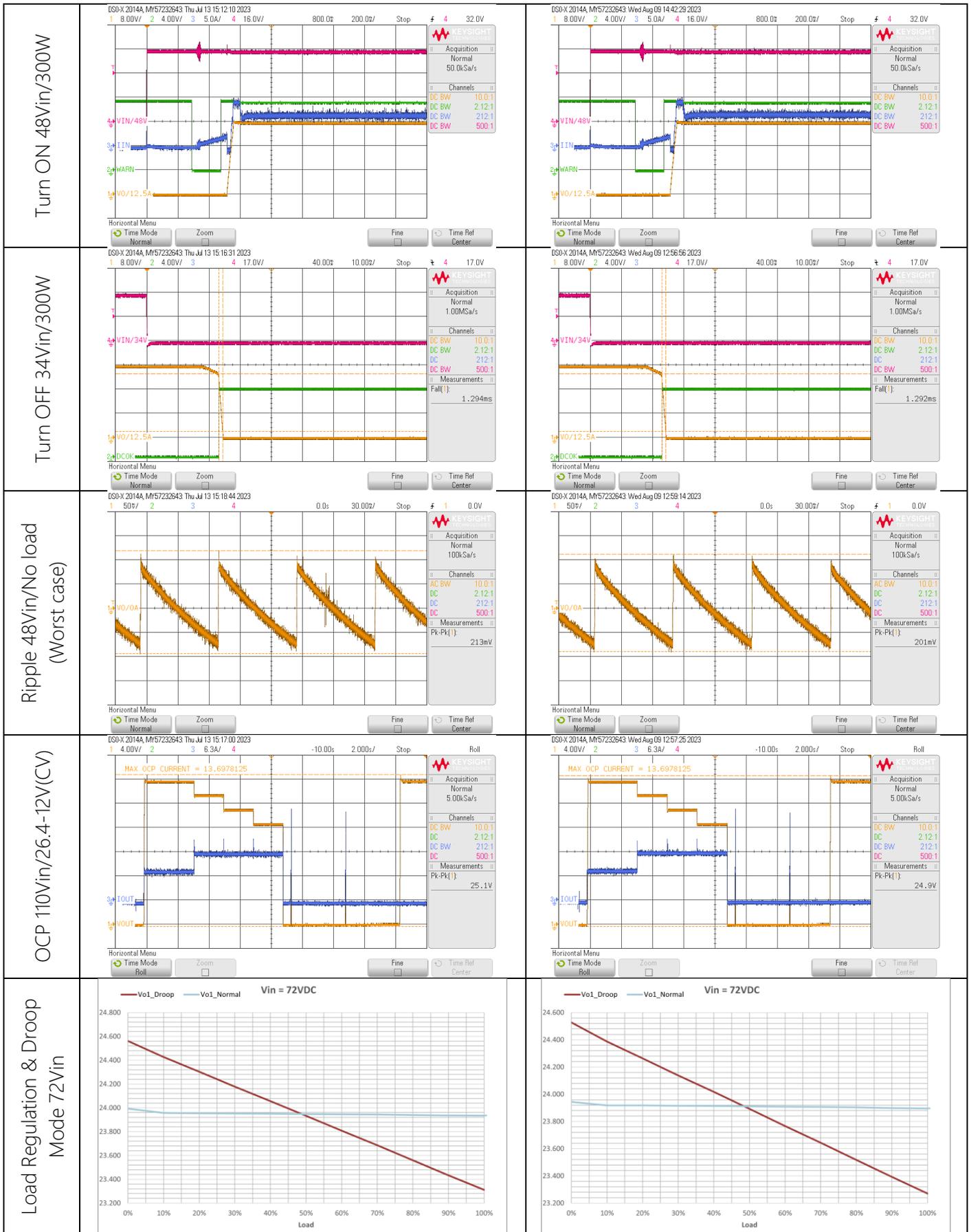
The visual inspection does not show any damage or issues.

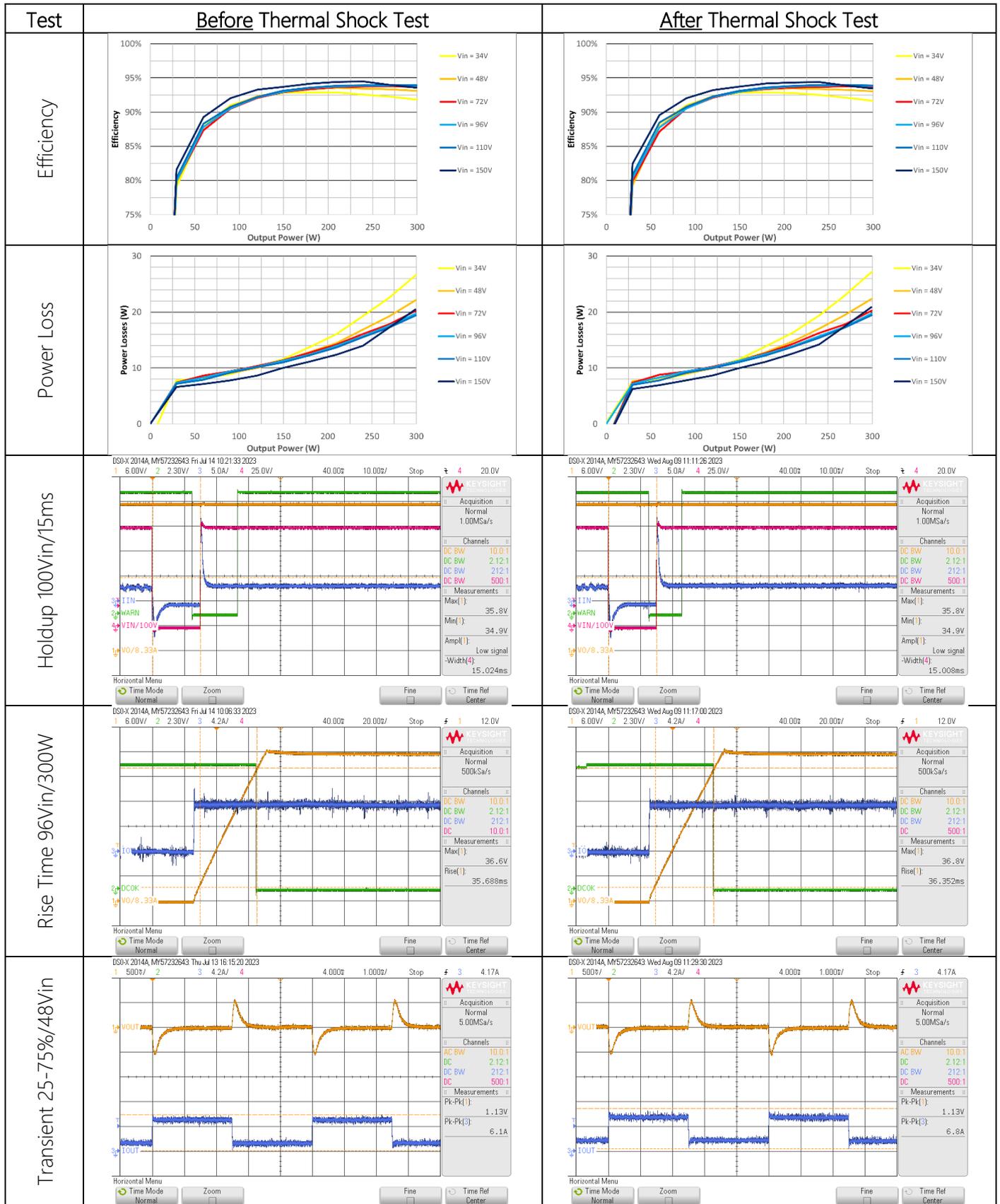
It can be concluded that the thermal shock test was passed successfully.

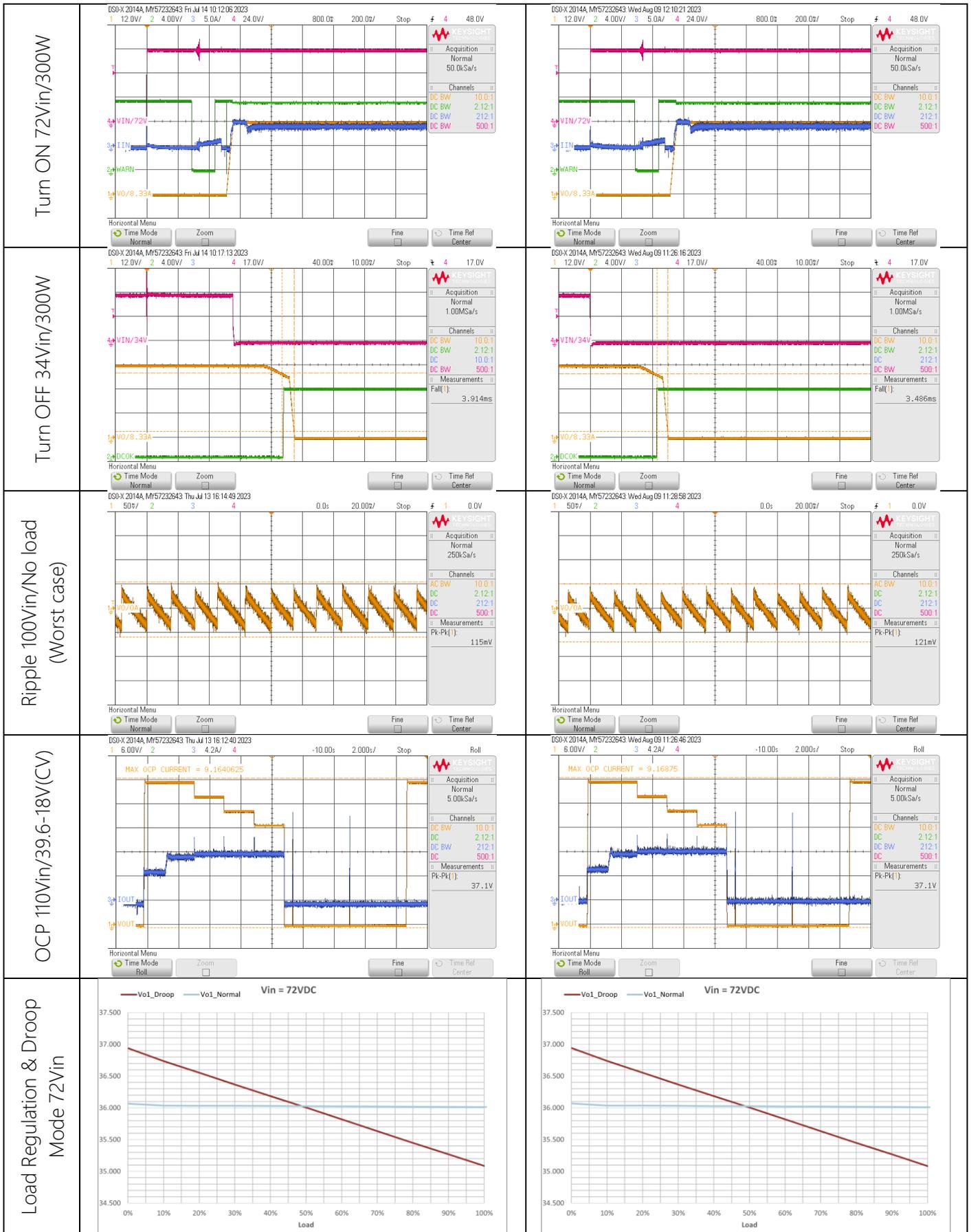
# Appendix 1 - Performance Test Results

VCCR300-24 Engineering Sample, S/N: 2328CXX0004



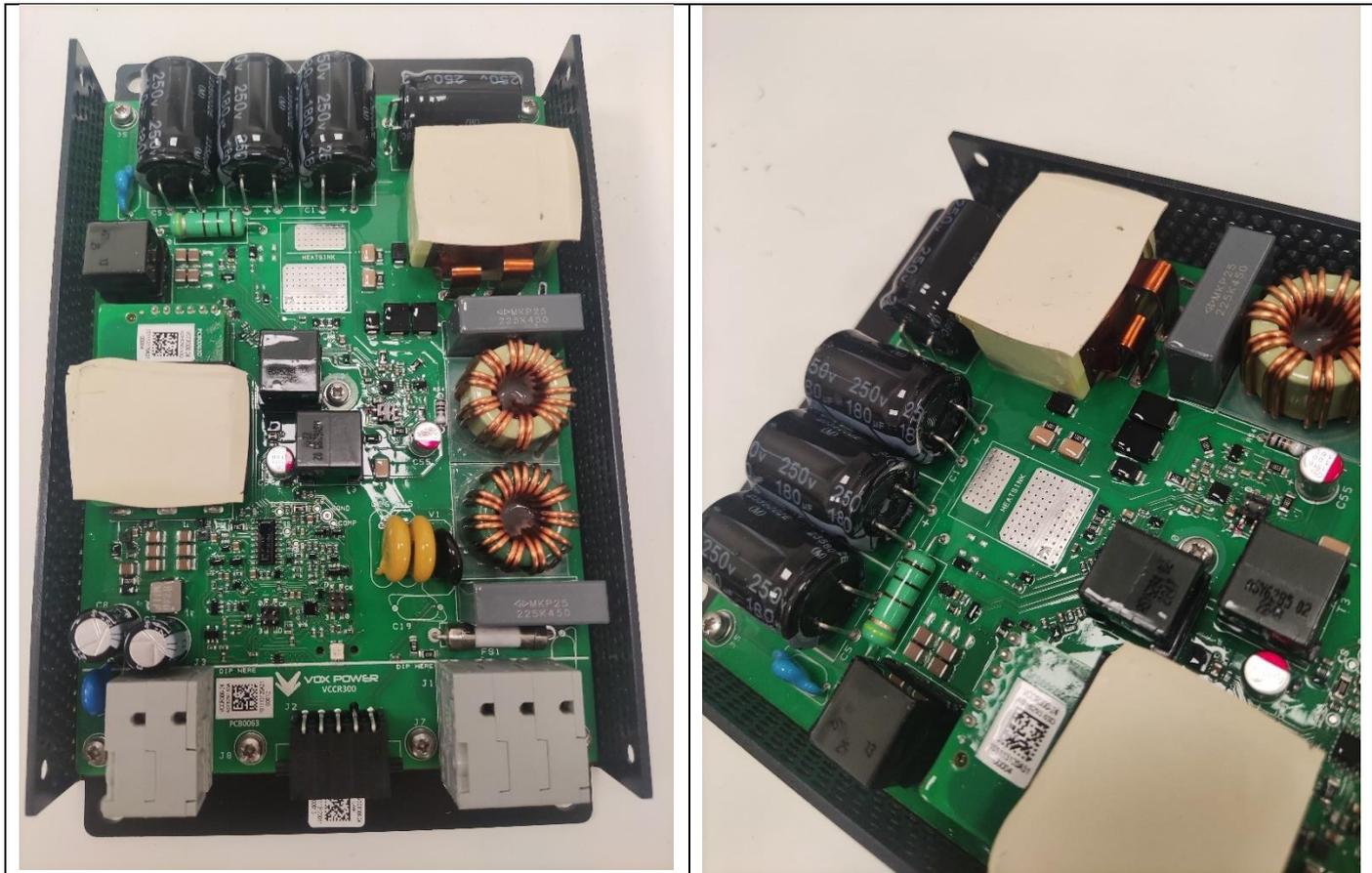


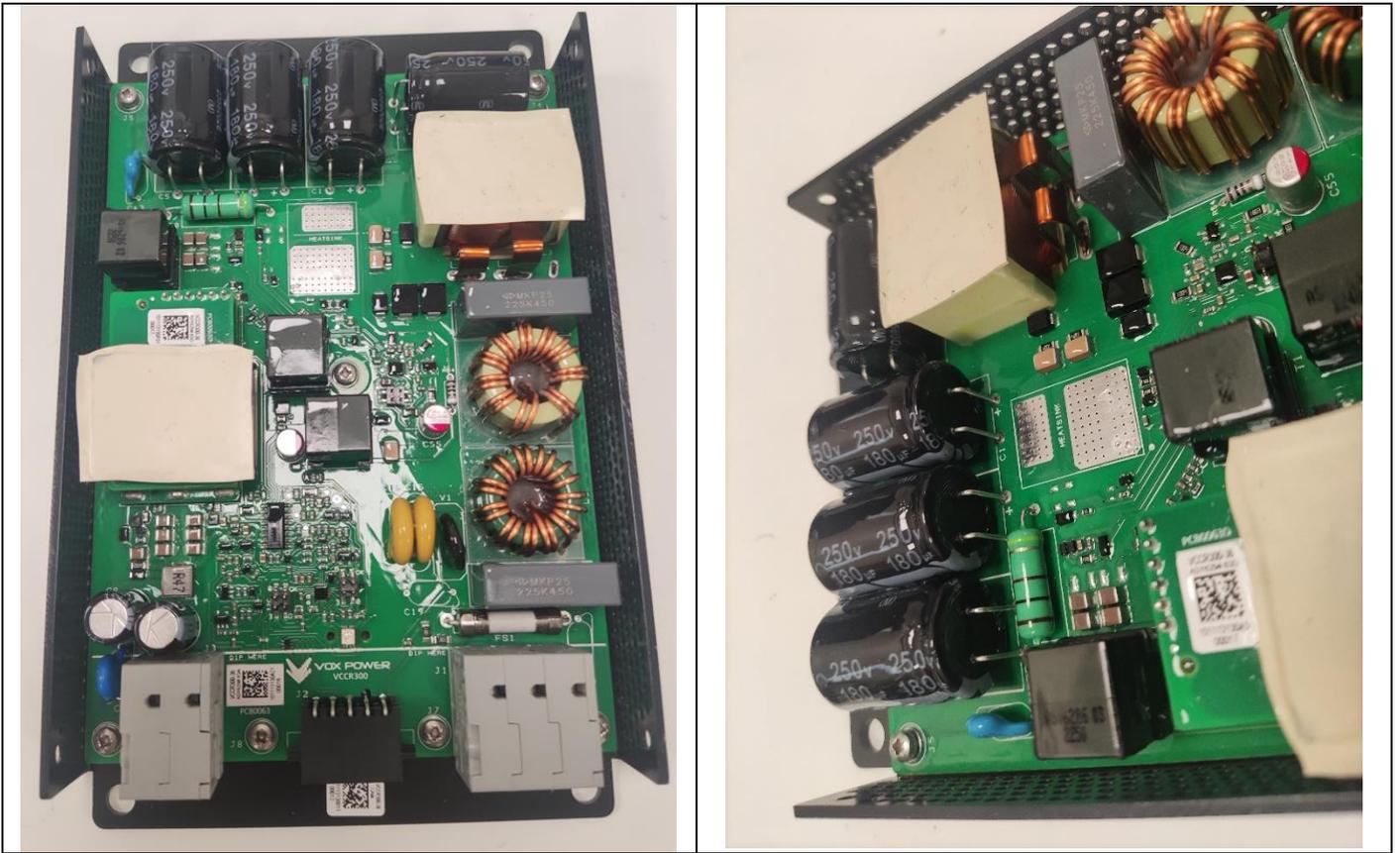




# Appendix 2 - Visual Inspection

VCCR300-24 Engineering Sample, S/N: 2328CXX0004

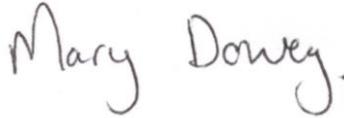




# Appendix 3 – Thermal Shock Test

**THERMAL SHOCK TEST FOR VOX POWER IN ACCORDANCE MIL-STD-810G:  
METHOD 503.5 PROCEDURE I-C.**

**TEST REPORT**

Author: (Name)	Author: (Signature)	Date:
Abbey Brady		2023-08-11
Approver: (Name)	Approver: (Signature)	Date:
Mary Dowey		2023-08-11

## CONTRACT INFORMATION

<b>Customer:</b>	Vox Power
<b>PO Number:</b>	PO: 11316
<b>Contact Name:</b>	Brian McDonald
<b>Customer Address:</b>	Unit 2, Redcow Interchange Estate, Ballymount, Dublin, Ireland
<b>Test Specimen:</b>	P/N: VCCR300-24, S/N: 2328CXX0004 P/N: VCCR300-36, S/N: 2328CXX0006
<b>Specimen Receipt Date:</b>	2023-07-20
<b>Date of Test:</b>	2023-07-25
<b>Date of Report:</b>	2023-08-11
<b>Test Method to be Used:</b>	MIL-STD-810G: Method 503.5 Procedure I-C.
<b>Any Deviation from Test Method:</b>	N/A
<b>Results summary:</b>	Testing was carried out as per customer's specification without witnessing. No determination on the pass/fail of the test specimen has been made.
<b>Customer onsite representatives:</b>	N/A

All testing is carried out in compliance with the requirements and specifications detailed above, and the results apply to the specimen tested. Opinions and interpretations are not given by Resonate Testing Ltd.

Testing was carried out on this test specimen only and provides no verification for the performance of other items in the same batch, or production run.

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## 1 Test Specimen

<b>Customer Description:</b>	Conduction cooled power supply VCCR300 series
<b>Customer Unique ID:</b>	P/N: VCCR300-24, S/N: 2328CXX0004 P/N: VCCR300-36, S/N: 2328CXX0006
<b>Condition on receipt:</b>	Suitable for testing
Testing was carried out on this test specimen only and provides no verification for the performance of other items in the same batch, or production run.	

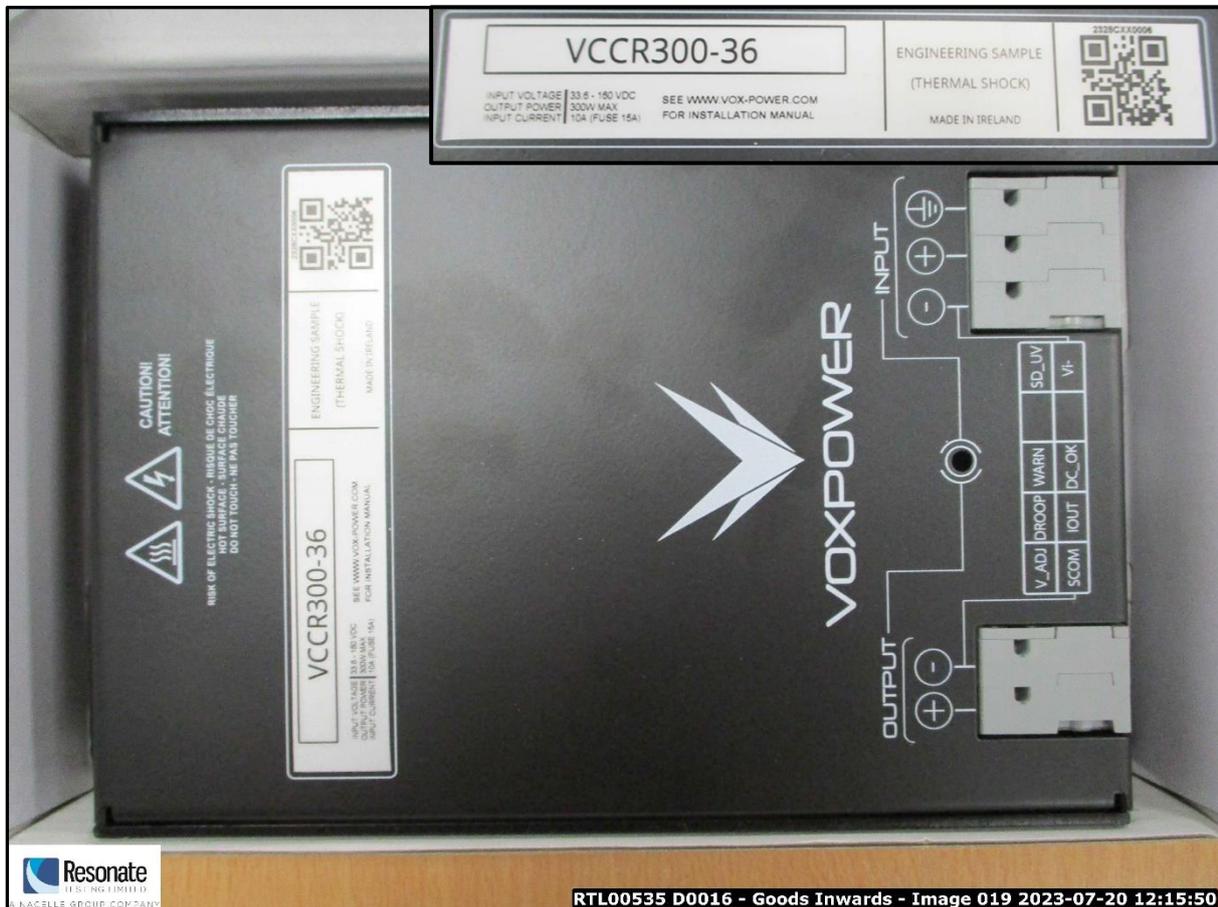


Figure 1: Test specimen - P/N: VCCR300-36, S/N: 2328CXX0006



Figure 2: Test specimen - P/N: VCCR300-24, S/N: 2328CXX0004

## 2 Test Specification

### 2.1 General

Testing was carried out in accordance with the customers' requirements as specified in:

<b>Document reference:</b>	Testing was carried out in compliance with MIL-STD-810G: Method 503.5 Procedure I-C. Multi-cycle. 3 shocks. T1 = -51°C & T2= 85°C
<b>Date received:</b>	Received by email from Brian McDonald at 2023-06-29 16:26.

### 2.2 Test Procedure

A thermal shock test was carried out in accordance with MIL-STD-810G: Method 503.5 Procedure I-C. the test specimens experienced 3 shock cycles at the required temperatures: T1 = -51°C and T2= 85°C

- c. Procedure I-C Multi-cycle shocks from constant extreme temperature. There is little available data to substantiate a specific number of shocks when more frequent exposure is expected. In lieu of better information, apply a minimum of three shocks at each condition, i.e., three transfers from cold to hot, three transfers from hot to cold, and a stabilization period after each transfer. The number of shocks depends primarily on the anticipated service events (paragraph 503.6-3 and paragraph 4.4.2.1c). The objective of this test is to determine the effect of rapid temperature changes to the materiel. Therefore, expose the test item to the temperature extremes for a duration equal to either the actual operation, or to that required to achieve temperature stabilization within the limitations shown in paragraphs 1.2.1, 1.3, 2.1.1, and 2.3.5.

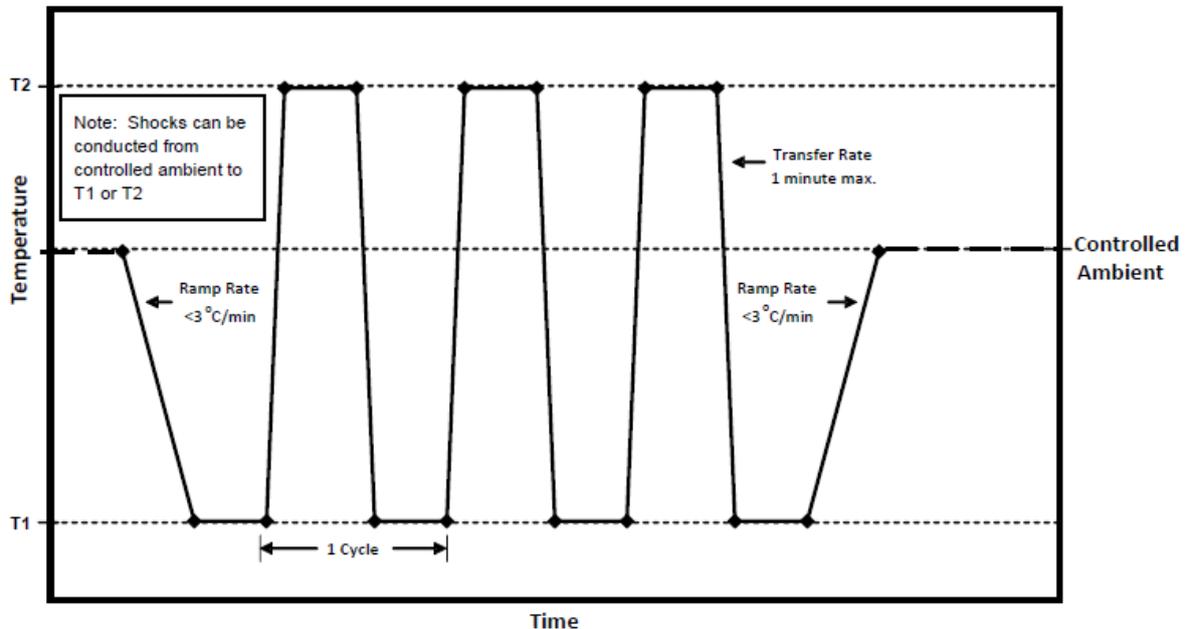


Figure 3: Temperature profile excerpt from MIL-STD-810G Method 503.5 Procedure I-C.

### 2.3 Environmental Conditions

The test was carried out under standard laboratory conditions:

Temperature: +15 to +35 degrees Celsius.

Relative Humidity: Not greater than 85 percent.

Ambient Pressure: 84 to 107 kPa (equivalent to +5,000 to -1,500 ft) (+1525 to -460m).

 <b>Resonate</b> TESTING LIMITED A NACELLE GROUP COMPANY	Test Report <h1 style="text-align: center;">Thermal Shock</h1>	Record No: <b>RTL00535 D0018</b> Rev No: 1 2023-08-11 Document Status: Approved
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### 3 Test Equipment and Instrumentation

#### 3.1 Test Laboratory

<b>Laboratory Address:</b>	Resonate Testing Limited Unit 1 Bridge Technology Park Carnagat Lane Carnagat Newry BT35 8XF
<b>Test Technician:</b>	Peter Mein
<b>Customer Onsite representatives:</b>	None

#### 3.2 Test Equipment

Testing was carried out using the Weiss Thermal Shock chamber which has the following specification (See Table 1).

**Table 1: Environmental chamber used**

Environmental Chamber		
 <p style="font-size: small; text-align: right;">Chamber Image 008 2022-05-24</p>	<b>Manufacturer:</b>	Weiss Technik
	<b>Model:</b>	TS 130
	<b>Temperature Range:</b>	Hot Chamber +60 to +220°C Cold Chamber -10 to -80°C
	<b>Transition Time:</b>	9 seconds
	<b>Serial No:</b>	59226120750010
	<b>Resonate Asset No</b>	RA01043
	<b>Note:</b>	

### 3.3 Test Instrumentation

#### 3.3.1 Traceability

All equipment has been calibrated as required using standards traceable to National or International standards (See Table 2).

**Table 2: Test Instrumentation used**

Ref No:	Serial No:	Description:	Cal Status:	Cal Expiry:	Accuracy:
RA00708	A0066/117	Temperature Datalogger	Calibrated	2024-06-01	±0.80°C
RA00713	149652-A-002	Type T Thermocouple	Calibrated	2024-05-31	±0.50°C
RA00716	149652-A-005	Type T Thermocouple	Calibrated	2024-05-31	±0.50°C
RA00719	149652-A-008	Type T Thermocouple	Calibrated	2024-05-31	±0.50°C

## 4 Test Results

### 4.1 Temperature Test – Setup

The test specimens were placed in the chamber as shown in

Figure 4. One type T thermocouple (TC) connected to a data logger, was used to monitor the chamber temperature throughout the test. Two type T thermocouples, connected to the same data logger, were used to monitor the test specimens' external temperature.

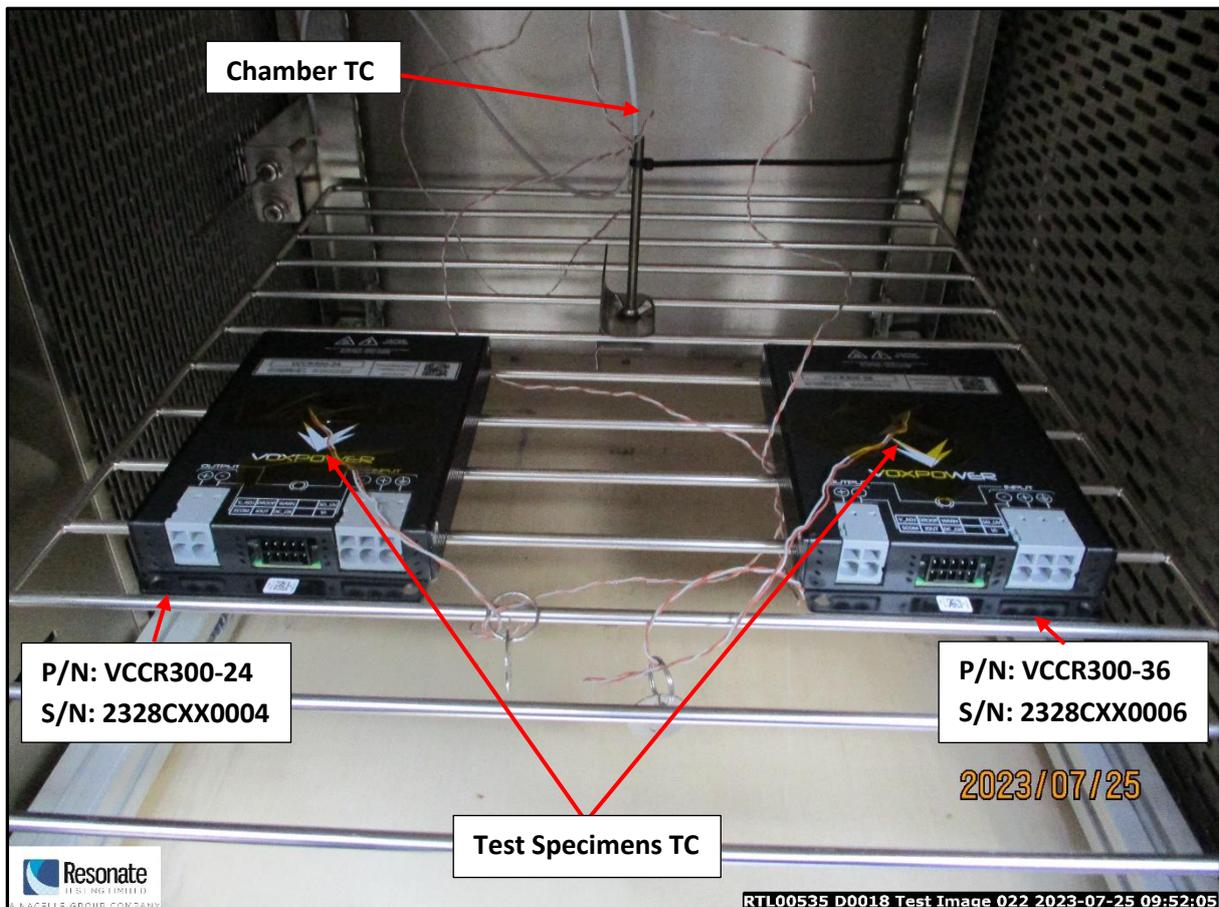
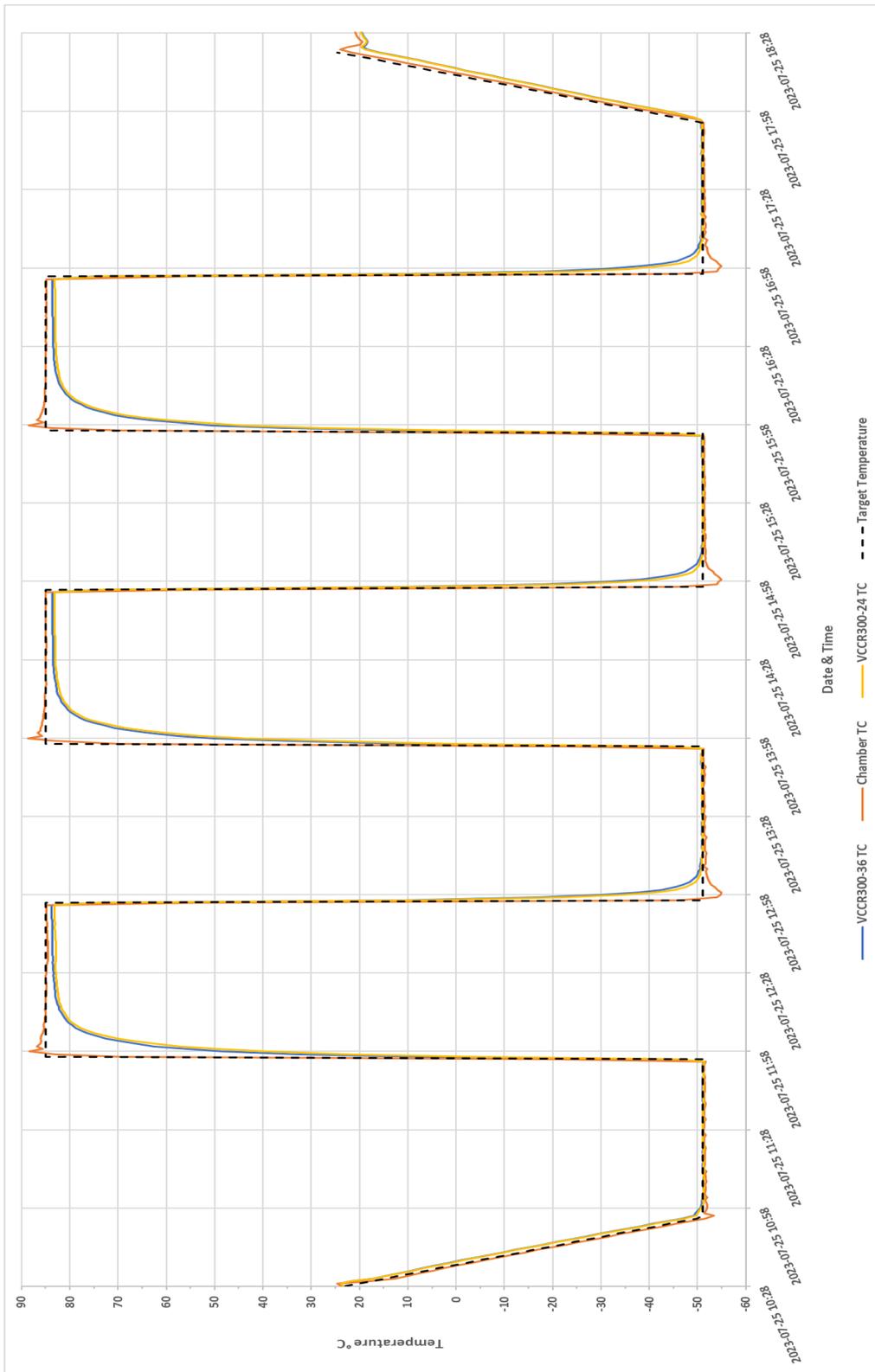


Figure 4: Units in chamber - Test setup

### 4.2 Recorded Temperature Data for Thermal Test

Figure 5 shows a plot of the temperature recorded during the test.



**Figure 5: Recorded Temperature plot**

### 4.3 Test Specimen- Post Test

Figure 6 shows the test specimens post-test, once removed from the test chamber.



**Figure 6: Test specimens - Post test**

## 5 Quality Assurance

Our technical competence and quality control arrangements are in accordance with the conditions of our quality management system.

## 6 Summary

The test specimens underwent temperature cycling (thermal shock) in accordance with the customer requirements.

**END OF REPORT**