

Report on the Testing of the
DP Block Active Input Module
Model Numbers:
34044-1-000
34044-1-100
34044-1-200



America

Add value.
Inspire trust.

In accordance with:
UN ECE R10:2019 Addendum 9, Revision 6

Prepared for: Data Panel Corp.
181 Cheshire Lane, Suite 300.
Plymouth, MN 55441 USA

COMMERCIAL-IN-CONFIDENCE

Document Number: NC72167639.1 | Issue: 1

SIGNATURE

NAME	JOB TITLE	RESPONSIBLE FOR	ISSUE DATE
Brad A Reasoner	EMC Test Engineer	Authorized Signatory	29 March 2021

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD America, Inc. document control rules.

EXECUTIVE SUMMARY

A sample of this product was tested and found to be compliant with the standards listed above.



A2LA Cert. No. 2955.11

DISCLAIMER AND COPYRIGHT

This non-binding report has been prepared by TÜV SÜD America with all reasonable skill and care. The document is confidential to the potential Client and TÜV SÜD America. No part of this document may be reproduced without the prior written approval of TÜV SÜD America. © TÜV SÜD.

ACCREDITATION

Our A2LA Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our A2LA Accreditation.

TÜV SÜD America Inc
141 14th Street NW
New Brighton, MN 55112

Phone: 651-631-2487
www.tuv-sud-america.com



Contents

1	Report Summary	3
1.1	Report Modification Record.....	3
1.2	Introduction.....	3
1.3	Summary of Tests & Results.....	4
1.4	Product Information	4
1.5	Deviations from the Standard.....	6
1.6	EUT Modification Record	6
1.7	Test Location	6
2	Test Details	7
2.1	Radiated Emissions.....	8
2.2	Transient Emissions	22
2.3	Radiated Immunity Tests	28
2.4	Immunity to Conducted Transients on Power Leads	36
3	Accreditation, Disclaimers and Copyright.....	62
4	Customer Test Plan / Product Information.....	63



1 Report Summary

1.1 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Table 1.1-1 – Modification Record

Issue	Description of Change	Date of Issue
1	First Issue	29 March 2021

1.2 Introduction

Applicant	Data Panel Corp.
Manufacturer	Data Panel Corp.
Applicant’s Email Address	llim@datapanel.com
Model Number(s)	34044-1-000 34044-1-100 34044-1-200
Serial Number(s)	21090077M 21100103D 21100104F
Hardware Version	PCB Rev 201G
Software Version	0218 0218 0110
Number of Samples Tested	3 for RE and RS, 1 for CTI and CTE
Test Specification/Issue/Date	UN ECE R10:2019 Addendum 9, Revision 6
Order Number	72167639
Date of Receipt of EUT	23 March 2021
Condition of EUT	Normal – No Damage
Start of Test	23 March 2021
Finish of Test	24 March 2021
Related Document(s)	34044-1 Test Plan.docx



1.3 Summary of Tests & Results

A summary of the tests carried out in accordance with the specifications shown below.

Table 1.3-1 – Summary of Accreditation

Report Section	Specification Clause	Test Description	Accreditation	Comments/Base Standard
2.1	6.5 & 6.6	Radiated Emissions	A2LA	CISPR 25:2002
2.2	6.7	Conducted Transient Emissions	A2LA	ISO 7637-2:2004
2.3	6.8	Radiated Immunity	A2LA	ISO 11452-2:2004
2.4	6.9	Conducted Transient Immunity	A2LA	ISO 7637-2:2004

Table 1.3-2 – Summary of Results

Test Name	Name of Tester(s)	Result
Radiated Emissions	Lester Roemhildt	Pass
Conducted Transient Emissions	Lester Roemhildt	Pass
Radiated Immunity	Lester Roemhildt	Pass
Conducted Transient Immunity	Lester Roemhildt	Pass

1.4 Product Information

1.4.1 Technical Description

The Equipment Under Test (EUT) was a DP Block active input modules designed to meet the requirements of the utility truck market.

A full description and detailed product specification details are available from the manufacturer.

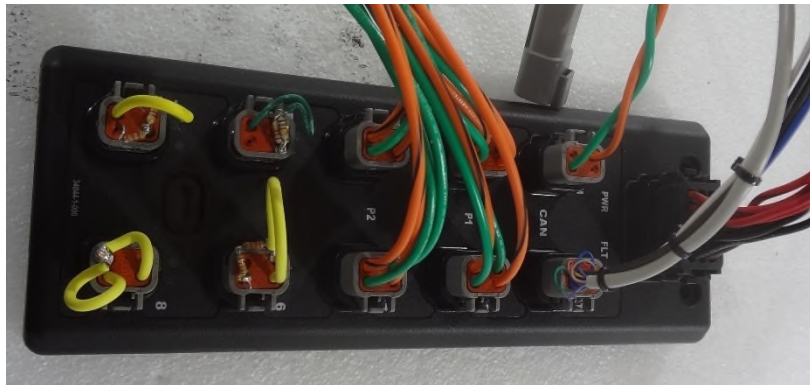


Photo 1.4-1 – Front View of the EUT – Model 34044-1-000



Photo 1.4-2 – Front View of the EUT – Model 34044-1-100



Photo 1.4-3 – Front View of the EUT – Model 34044-1-200



Table 1.4-1 – Cable Descriptions

Cable/Port	Description
Power	24Vdc Power Input
Data	Data Communication
I/O Bundle	Various I/O cable bundle

Table 1.4-2 – Support Equipment Descriptions

Make/Model	Description
Laptop with AC adapter	Test computer with Monitoring Software
PCAN – LWL Model 1PEH - 002026	TÜV SÜD Transceivers

1.4.2 Modes of Operation

The tested mode of operation was The EUT powered using 24 VDC for all testing. The EUT was setup and communicating to the support laptop.

1.5 Deviations from the Standard

No deviations from the applicable test standard were made during testing.

1.6 EUT Modification Record

The table below details modifications made to the EUT during the test program. The modifications incorporated during each test are recorded on the appropriate test pages.

Table 1.6-1 – Modification Record

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
0	Initial State		

1.7 Test Location

TÜV SÜD conducted the following tests at our New Brighton, MN Test Laboratory.

TÜV SÜD America
 141 14th Street NW
 New Brighton, MN 55112 USA



2 Test Details

Class A: all functions of a device or system perform as designed during and after exposure to a disturbance.

Class B: all functions of a device or system perform as designed during exposure; however, one or more of them may go beyond the specified tolerance. All functions return automatically to within normal limits after exposure is removed. Memory functions shall remain class A.

Class C: one or more functions of a device or system do not perform as designed during exposure but return automatically to normal operation after exposure is removed.

Class D: one or more functions of a device or system do not perform as designed during exposure and do not return to normal operation until exposure is removed and the device or system is reset by a simple “operator/use” action.

Class E: one or more functions of a device or system do not perform as designed during and after exposure and cannot be returned to proper operation without repairing or replacing the device or system.



2.1 Radiated Emissions

2.1.1 Specification Reference

CISPR 25 per ECE R10:2019, Sections 6.5 & 6.6

2.1.2 Equipment Under Test

As shown in §1.4 with modification state “0”, as noted in §1.6.

2.1.3 Date of Test

23 March 2021

2.1.4 EUT Power

24 VDC

2.1.5 Test Method

The EUT was setup in a semi-anechoic chamber and laid on a non-conductive support 5cm above a copper ground plane table with a height of 90cm (± 10 cm). The EUT was placed 20cm from the front edge of the ground plane while the stretched-out cable bundle was 10cm from the front edge. Each measurement antenna had a height of 10cm above the ground plane table and a measurement distance of 1m from the front edge of the routed cabling. For the frequency range of 30-1000 MHz the antenna was centered on the test setup and focused on the cable bundle.

The EUT emission profile was made using a measurement receiver that utilized a peak and average detector for the required frequency ranges. The peak and average data collected was compared to the applicable test limits via software to determine pass or fail conditions. In the event a Quasi-peak measurement was required, the test software would identify those frequencies and a subsequent Quasi-peak measurement would be made. The test measurements were made in both horizontal and vertical antenna orientation for all frequencies above 30 MHz.

2.1.6 Environmental Conditions

The EUT was evaluated within the climatic range of the EUT as specified by the manufacturer. When the manufacturer does not specify climatic parameters for the EUT, all tests are performed within the ambient climatic conditions of the laboratory.



2.1.7 Additional Observations

The frequency range investigated was 30 MHz to 1 GHz.

Measurements were made using BAT-EMC (v3.18) automated software. Reported levels are the actual level with all the correction factors mathematically accounted for. Correction Factor column is for informational purposes only. See Section 2.1.8 below for sample computation.

2.1.8 Sample Computation (Electromagnetic Radiation Disturbance) – Example Only

Measuring equipment raw measurement (dB μ V) @ 30 MHz		20.0
Correction Factor (dB/m)	Cable 2	0.24
	NBLE11579 (antenna)	18.70
Reported Quasi-peak Final Measurement (dB μ V/m) @ 30 MHz		38.94

Note: The values shown above are for example purposes only and not a reflection of the measured data taken during this test program.

2.1.9 Test Results

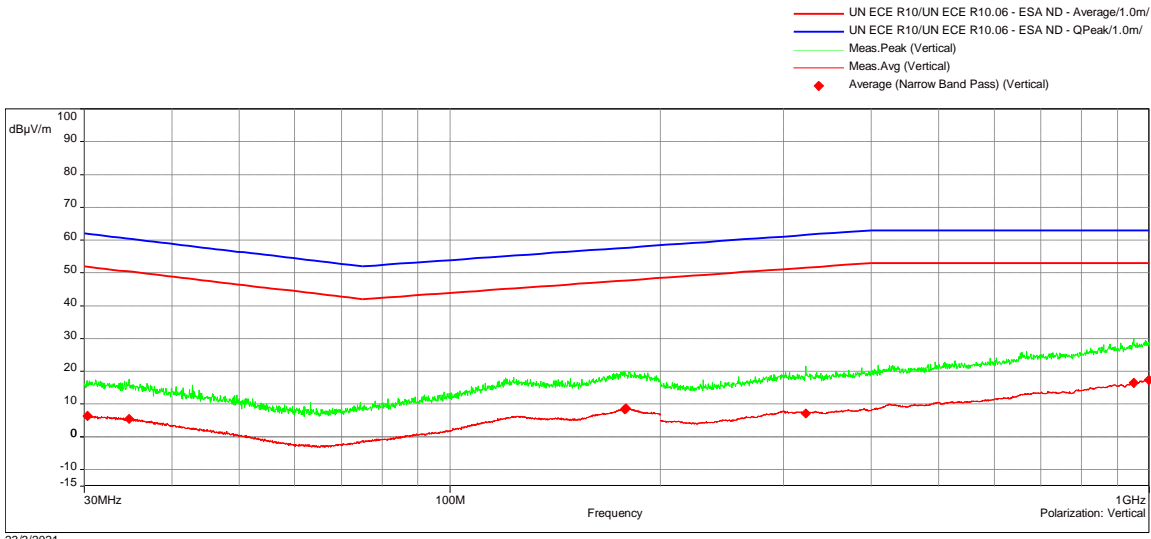
Test Summary: EUT operated as intended before, during, and after testing.

Test Result: Pass

See data below for detailed results.



Frequency Range	Antenna Distance	Antenna Height	Antenna Polarization	RBW	Step Size	Sweep Time
30MHz- 200MHz	1m	1m	Vertical	120kHz	50kHz	5 ms/Pts
200MHz- 1GHz	1m	1m	Vertical	120kHz	50kHz	5 ms/Pts



23/3/2021

Limit: UN ECE R10.06 - ESA **Class** ND **EUT Orientation:** Front **Test Results:** Pass

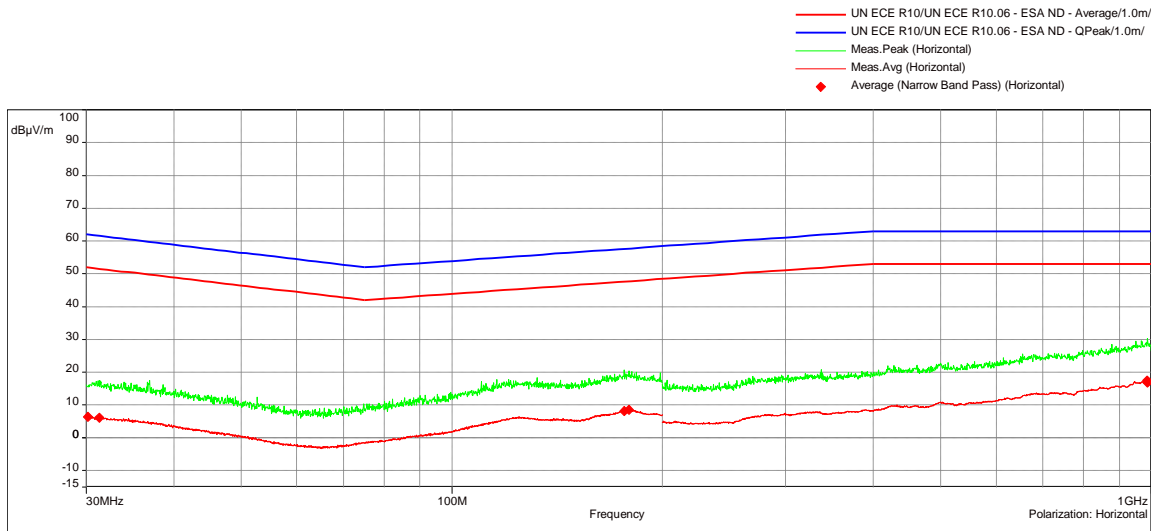
Figure 2.1-1 – Graphical Results for 30 MHz-1 GHz – Vertical – Ambient

Table 2.1-1 – Data Table for 30 MHz-1 GHz – Vertical – Ambient

Frequency	Peak (dBµV/m)	Average (dBµV/m)	Average Limit (dBµV/m)	Average Margin (dB)	QPeak Limit (dBµV/m)	Peak-Avg Delta	Results
30.35MHz	17.14	6.35	51.87	-45.53	61.87	10.79	Pass
34.75MHz	17.57	5.50	50.40	-44.90	60.40	12.07	Pass
177.75MHz	20.06	8.37	47.67	-39.30	57.67	11.69	Pass
178.65MHz	17.84	8.61	47.70	-39.10	57.70	9.23	Pass
322.7MHz	21.54	7.08	51.59	-44.51	61.59	14.47	Pass
950.75MHz	29.96	16.49	53.00	-36.51	63.00	13.47	Pass
998.65MHz	27.21	17.29	53.00	-35.71	63.00	9.93	Pass



Frequency Range	Antenna Distance	Antenna Height	Antenna Polarization	RBW	Step Size	Sweep Time
30MHz- 200MHz	1m	1m	Horizontal	120kHz	50kHz	5 ms/Pts
200MHz- 1GHz	1m	1m	Horizontal	120kHz	50kHz	5 ms/Pts



Limit: UN ECE R10.06 - ESA **Class:** ND **EUT Orientation:** Front **Test Results:** Pass

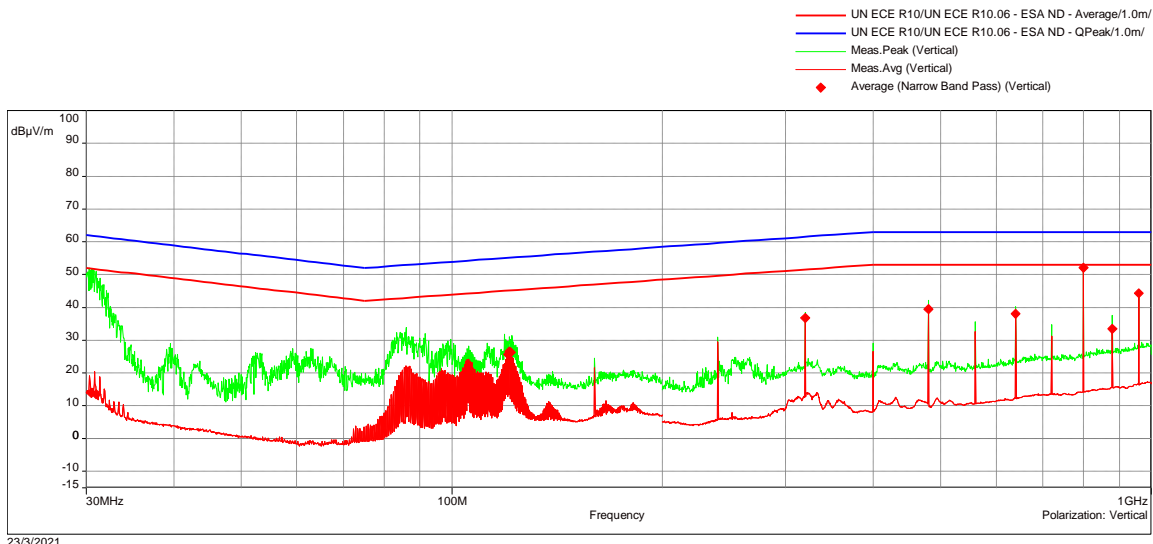
Figure 2.1-2 – Graphical Results for 30 MHz-1 GHz – Horizontal – Ambient

Table 2.1-2 – Data Table for 30 MHz-1 GHz – Horizontal – Ambient

Frequency	Peak (dBuV/m)	Average (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)	QPeak Limit (dBuV/m)	Peak-Avg Delta	Results
30.15MHz	15.51	6.33	51.95	-45.62	61.95	9.18	Pass
31.3MHz	17.48	6.06	51.54	-45.48	61.54	11.42	Pass
176.4MHz	20.69	8.08	47.62	-39.54	57.62	12.60	Pass
179.05MHz	17.76	8.48	47.72	-39.23	57.72	9.28	Pass
986.75MHz	27.40	17.48	53.00	-35.52	63.00	9.92	Pass
987.85MHz	30.20	16.79	53.00	-36.21	63.00	13.41	Pass



Frequency Range	Antenna Distance	Antenna Height	Antenna Polarization	RBW	Step Size	Sweep Time
30MHz- 200MHz	1m	1m	Vertical	120kHz	50kHz	5 ms/Pts
200MHz- 1GHz	1m	1m	Vertical	120kHz	50kHz	5 ms/Pts



Limit: UN ECE R10.06 - ESA
Class: ND
EUT Orientation: Front
Test Results: Pass

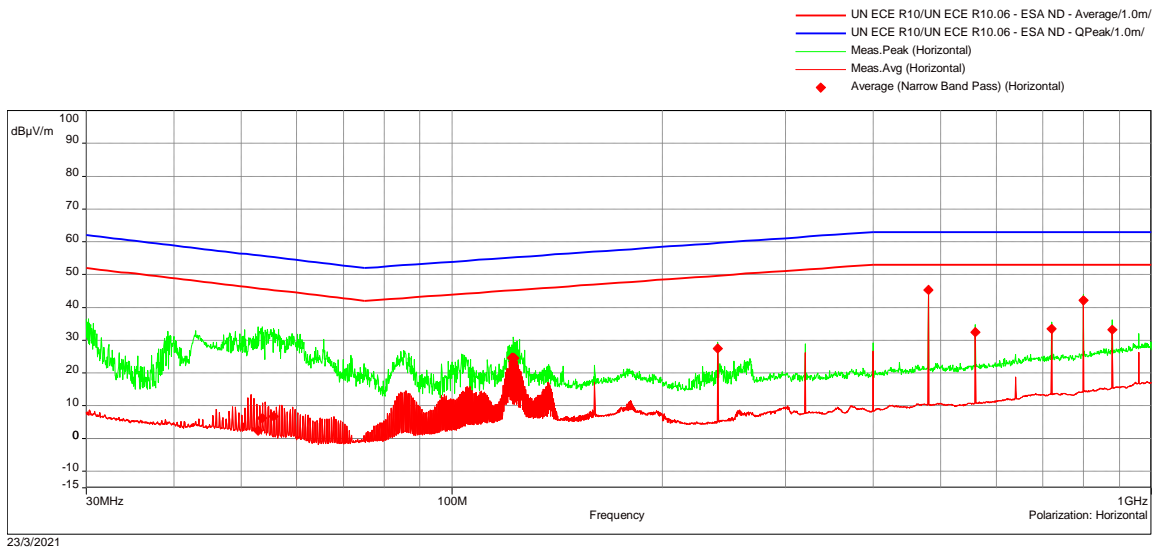
Figure 2.1-3 – Graphical Results for 30 MHz-1 GHz – Vertical – Operational – Model 34044-1-000

Table 2.1-3 – Data Table for 30 MHz-1 GHz – Vertical – Operational – Model 34044-1-000

Frequency	Peak (dBuV/m)	Average (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)	QPeak Limit (dBuV/m)	Peak-Avg Delta	Results
30.5MHz	51.75	13.89	51.82	-37.92	61.82	37.85	Pass
31MHz	51.08	13.53	51.64	-38.11	61.64	37.55	Pass
120.4MHz	29.63	25.58	45.11	-19.53	55.11	4.04	Pass
120.9MHz	31.01	26.57	45.14	-18.57	55.14	4.44	Pass
121.4MHz	30.28	26.28	45.16	-18.88	55.16	4.00	Pass
320MHz	38.44	36.75	51.53	-14.79	61.53	1.69	Pass
480MHz	42.10	39.45	53.00	-13.55	63.00	2.64	Pass
640MHz	40.22	38.06	53.00	-14.94	63.00	2.17	Pass
800MHz	52.67	52.11	53.00	-0.89	63.00	0.56	Pass
880MHz	37.57	33.39	53.00	-19.61	63.00	4.19	Pass
960MHz	45.14	44.33	53.00	-8.67	63.00	0.81	Pass



Frequency Range	Antenna Distance	Antenna Height	Antenna Polarization	RBW	Step Size	Sweep Time
30MHz- 200MHz	1m	1m	Horizontal	120kHz	50kHz	5 ms/Pts
200MHz- 1GHz	1m	1m	Horizontal	120kHz	50kHz	5 ms/Pts



Limit: UN ECE R10.06 - ESA **Class:** ND **EUT Orientation:** Front **Test Results:** Pass

Figure 2.1-4 – Graphical Results for 30 MHz-1 GHz – Horizontal – Operational – Model 34044-1-000

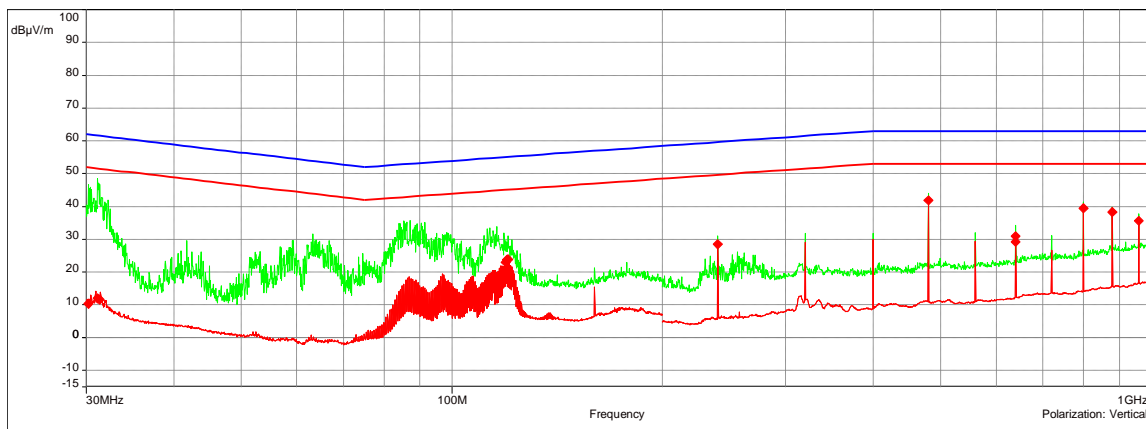
Table 2.1-4 – Data Table for 30 MHz-1 GHz – Horizontal – Operational – Model 34044-1-000

Frequency	Peak (dBuV/m)	Average (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)	QPeak Limit (dBuV/m)	Peak-Avg Delta	Results
52.85MHz	34.11	2.39	45.82	-43.43	55.82	31.72	Pass
53.55MHz	34.02	6.27	45.68	-39.41	55.68	27.75	Pass
55.6MHz	33.63	6.74	45.27	-38.53	55.27	26.88	Pass
121.9MHz	28.58	24.62	45.19	-20.57	55.19	3.96	Pass
122.4MHz	30.92	24.59	45.22	-20.63	55.22	6.33	Pass
122.9MHz	29.33	24.55	45.25	-20.70	55.25	4.78	Pass
240MHz	29.36	27.45	49.64	-22.20	59.64	1.91	Pass
480MHz	45.85	45.27	53.00	-7.73	63.00	0.58	Pass
560MHz	34.75	32.39	53.00	-20.61	63.00	2.35	Pass
720MHz	35.45	33.49	53.00	-19.51	63.00	1.96	Pass
800MHz	43.90	42.19	53.00	-10.81	63.00	1.71	Pass
880MHz	36.23	33.12	53.00	-19.88	63.00	3.11	Pass



Frequency Range	Antenna Distance	Antenna Height	Antenna Polarization	RBW	Step Size	Sweep Time
30MHz- 200MHz	1m	1m	Vertical	120kHz	50kHz	5 ms/Pts
200MHz- 1GHz	1m	1m	Vertical	120kHz	50kHz	5 ms/Pts

— UN ECE R10/UN ECE R10.06 - ESA ND - Average/1.0m/
— UN ECE R10/UN ECE R10.06 - ESA ND - QPeak/1.0m/
— Meas.Peak (Vertical)
— Meas.Avg (Vertical)
♦ Average (Narrow Band Pass) (Vertical)



25/3/2021

Limit: UN ECE R10.06 - ESA **Class** ND **EUT Orientation:** Front **Test Results:** Pass

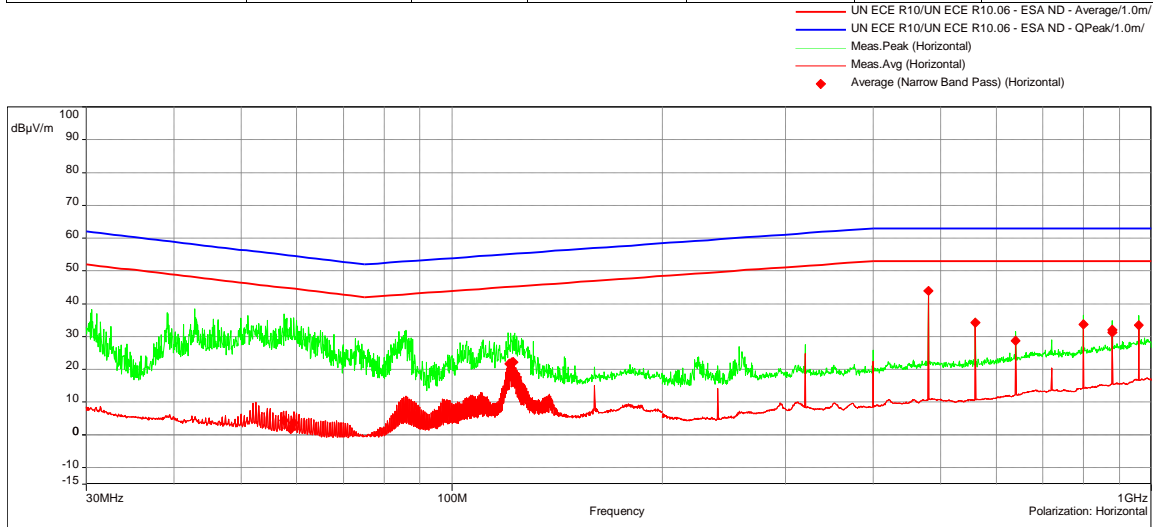
Figure 2.1-5 – Graphical Results for 30 MHz-1 GHz – Vertical – Operational – Model 34044-1-100

Table 2.1-5 – Data Table for 30 MHz-1 GHz – Vertical – Operational – Model 34044-1-100

Frequency	Peak (dBuV/m)	Average (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)	QPeak Limit (dBuV/m)	Peak-Avg Delta	Results
30.2MHz	46.60	10.29	51.93	-41.64	61.93	36.31	Pass
31.15MHz	48.52	11.94	51.59	-39.65	61.59	36.58	Pass
31.35MHz	46.74	11.57	51.52	-39.95	61.52	35.17	Pass
119.35MHz	29.56	22.95	45.05	-22.10	55.05	6.60	Pass
119.85MHz	29.08	23.71	45.08	-21.37	55.08	5.37	Pass
120.35MHz	29.20	23.90	45.11	-21.21	55.11	5.31	Pass
240MHz	31.05	28.40	49.64	-21.24	59.64	2.65	Pass
480MHz	43.99	41.87	53.00	-11.13	63.00	2.13	Pass
639.95MHz	34.21	29.21	53.00	-23.79	63.00	4.99	Pass
640MHz	32.94	30.84	53.00	-22.16	63.00	2.11	Pass
800MHz	41.35	39.48	53.00	-13.52	63.00	1.86	Pass
880MHz	39.81	38.28	53.00	-14.72	63.00	1.53	Pass
960MHz	37.77	35.57	53.00	-17.43	63.00	2.20	Pass



Frequency Range	Antenna Distance	Antenna Height	Antenna Polarization	RBW	Step Size	Sweep Time
30MHz- 200MHz	1m	1m	Horizontal	120kHz	50kHz	5 ms/Pts
200MHz- 1GHz	1m	1m	Horizontal	120kHz	50kHz	5 ms/Pts



25/3/2021

Limit: UN ECE R10.06 - ESA **Class** ND **EUT Orientation:** Front **Test Results:** Pass

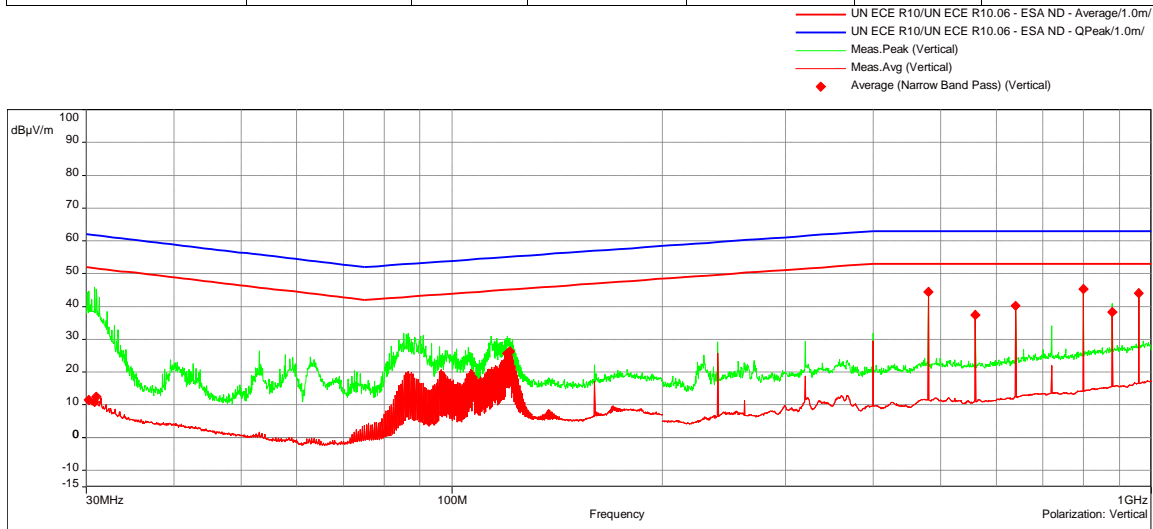
Figure 2.1-6 – Graphical Results for 30 MHz-1 GHz – Horizontal – Operational – Model 34044-1-100

Table 2.1-6 – Data Table for 30 MHz-1 GHz – Horizontal – Operational – Model 34044-1-100

Frequency	Peak (dBuV/m)	Average (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)	QPeak Limit (dBuV/m)	Peak-Avg Delta	Results
57.5MHz	36.92	4.47	44.90	-40.43	54.90	32.44	Pass
58.8MHz	35.65	1.69	44.66	-42.96	54.66	33.96	Pass
59.35MHz	35.79	3.63	44.55	-40.92	54.55	32.15	Pass
120.85MHz	27.05	21.69	45.13	-23.45	55.13	5.36	Pass
121.85MHz	28.41	22.09	45.19	-23.10	55.19	6.32	Pass
122.35MHz	30.20	22.18	45.22	-23.04	55.22	8.03	Pass
480MHz	44.83	43.89	53.00	-9.11	63.00	0.94	Pass
560MHz	35.63	34.19	53.00	-18.81	63.00	1.44	Pass
640MHz	31.46	28.74	53.00	-24.26	63.00	2.72	Pass
800MHz	36.47	33.67	53.00	-19.33	63.00	2.80	Pass
879.95MHz	34.85	31.25	53.00	-21.75	63.00	3.61	Pass
880MHz	34.83	32.05	53.00	-20.95	63.00	2.78	Pass
960MHz	36.42	33.44	53.00	-19.56	63.00	2.99	Pass



Frequency Range	Antenna Distance	Antenna Height	Antenna Polarization	RBW	Step Size	Sweep Time
30MHz- 200MHz	1m	1m	Vertical	120kHz	50kHz	5 ms/Pts
200MHz- 1GHz	1m	1m	Vertical	120kHz	50kHz	5 ms/Pts



25/3/2021

Limit: UN ECE R10.06 - ESA
 Class ND
 EUT Orientation: Front
 Test Results: Pass

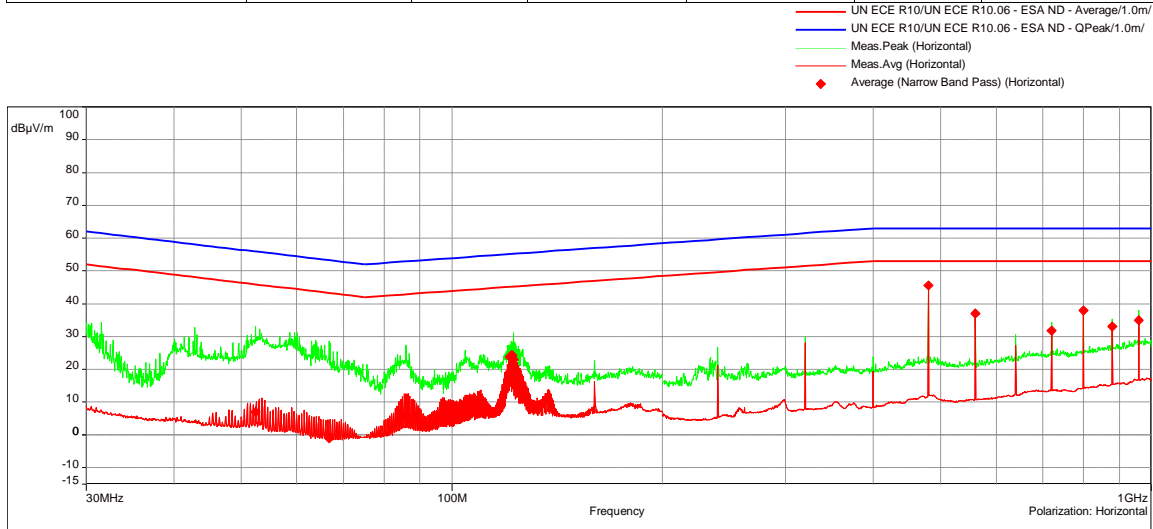
Figure 2.1-7 – Graphical Results for 30 MHz-1 GHz – Vertical – Operational – Model 34044-1-200

Table 2.1-7 – Data Table for 30 MHz-1 GHz – Vertical – Operational – Model 34044-1-200

Frequency	Peak (dBuV/m)	Average (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)	QPeak Limit (dBuV/m)	Peak-Avg Delta	Results
30.25MHz	44.62	11.44	51.91	-40.47	61.91	33.18	Pass
30.85MHz	45.80	10.85	51.70	-40.85	61.70	34.95	Pass
31MHz	45.19	12.50	51.64	-39.14	61.64	32.69	Pass
119.95MHz	30.83	25.70	45.09	-19.39	55.09	5.13	Pass
120.45MHz	29.95	25.95	45.11	-19.17	55.11	4.01	Pass
120.95MHz	30.26	26.34	45.14	-18.80	55.14	3.91	Pass
480MHz	45.67	44.38	53.00	-8.62	63.00	1.29	Pass
560MHz	38.69	37.43	53.00	-15.57	63.00	1.26	Pass
640MHz	40.99	40.15	53.00	-12.85	63.00	0.84	Pass
800MHz	46.65	45.34	53.00	-7.66	63.00	1.31	Pass
880MHz	40.88	38.30	53.00	-14.70	63.00	2.58	Pass
960MHz	45.07	43.99	53.00	-9.01	63.00	1.08	Pass



Frequency Range	Antenna Distance	Antenna Height	Antenna Polarization	RBW	Step Size	Sweep Time
30MHz- 200MHz	1m	1m	Horizontal	120kHz	50kHz	5 ms/Pts
200MHz- 1GHz	1m	1m	Horizontal	120kHz	50kHz	5 ms/Pts



25/3/2021

Limit: UN ECE R10.06 - ESA **Class** ND **EUT Orientation:** Front **Test Results:** Pass

Figure 2.1-8 – Graphical Results for 30 MHz-1 GHz – Horizontal – Operational – Model 34044-1-200

Table 2.1-8 – Data Table for 30 MHz-1 GHz – Horizontal – Operational – Model 34044-1-200

Frequency	Peak (dBµV/m)	Average (dBµV/m)	Average Limit (dBµV/m)	Average Margin (dB)	QPeak Limit (dBµV/m)	Peak-Avg Delta	Results
52.4MHz	33.08	7.02	45.91	-38.89	55.91	26.06	Pass
66.8MHz	28.60	-1.06	43.26	-44.32	53.26	29.66	Pass
121MHz	27.40	23.77	45.14	-21.37	55.14	3.63	Pass
121.5MHz	28.46	24.18	45.17	-20.99	55.17	4.28	Pass
122MHz	28.30	24.22	45.20	-20.98	55.20	4.08	Pass
122.5MHz	31.10	22.96	45.22	-22.26	55.22	8.14	Pass
480MHz	46.30	45.55	53.00	-7.45	63.00	0.74	Pass
560MHz	38.18	37.03	53.00	-15.97	63.00	1.15	Pass
720MHz	34.34	31.80	53.00	-21.20	63.00	2.53	Pass
800MHz	39.16	37.93	53.00	-15.07	63.00	1.23	Pass
880MHz	35.37	33.08	53.00	-19.92	63.00	2.30	Pass
960MHz	37.85	34.98	53.00	-18.02	63.00	2.87	Pass

2.1.10 Radiated Emissions Setup Photos



Photo 2.1-1 – 30-200 MHz Test Setup Model 34044-1-000

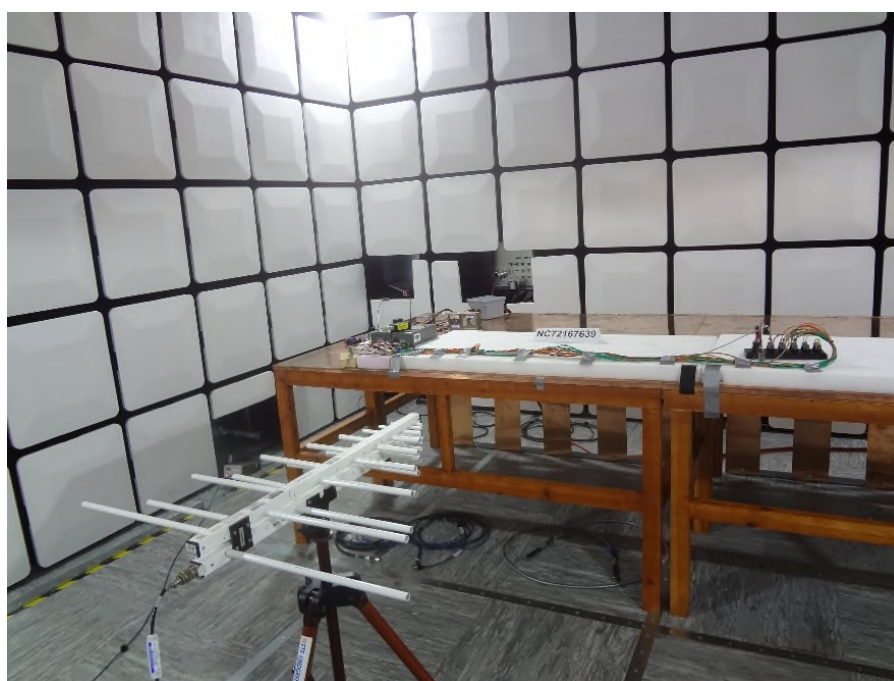


Photo 2.1-2 – 200-1000 MHz Test Setup Model 34044-1-000

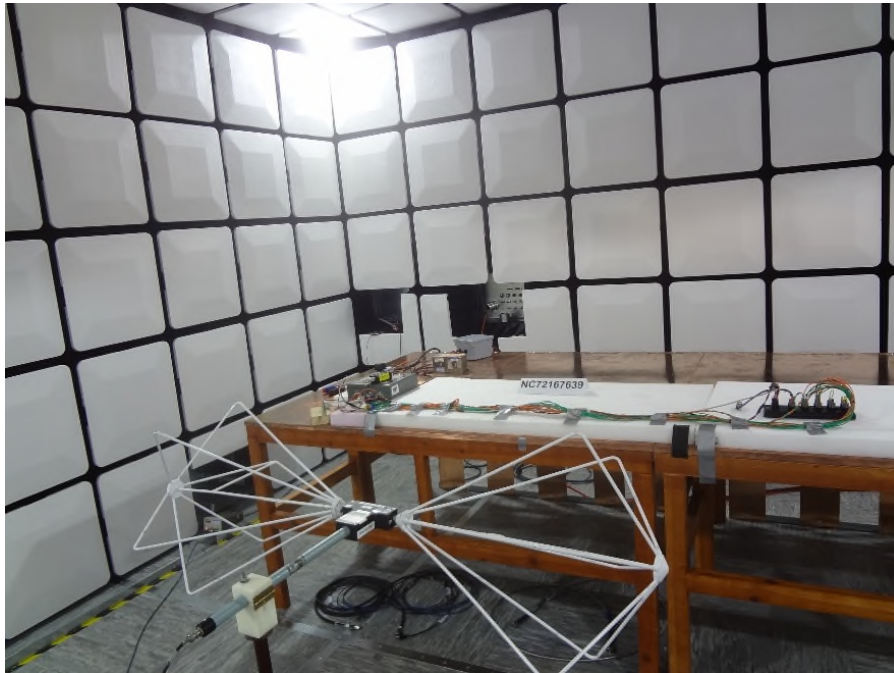


Photo 2.1-3 – 30-200 MHz Test Setup Model 34044-1-100

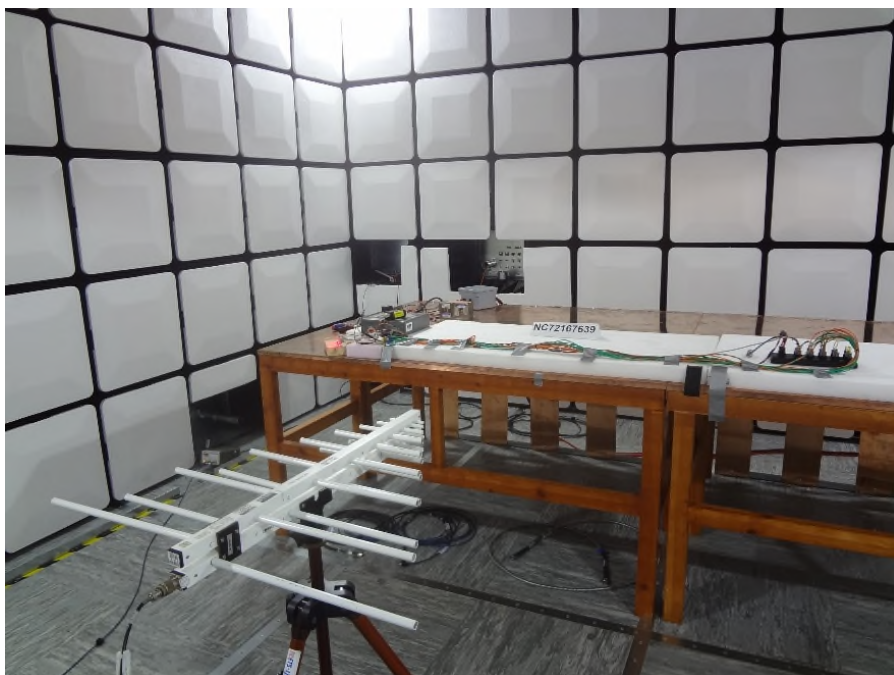


Photo 2.1-4 – 200-1000 MHz Test Setup Model 34044-1-100



Photo 2.1-5 – 30-200 MHz Test Setup Model 34044-1-200

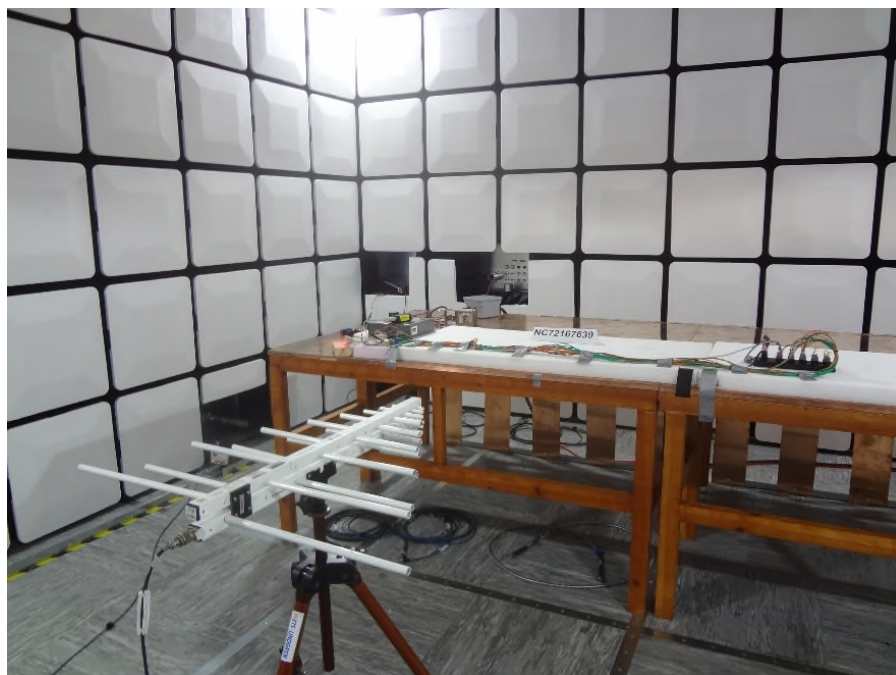


Photo 2.1-6 – 200-1000 MHz Test Setup Model 34044-1-200



2.1.11 Test Location and Test Equipment Used

This test was carried out in New Brighton, MN.
 Test Area: SAC2

Table 2.1-9 – Equipment List – Radiated Emissions

Device #	Manufacturer	Description	Model	Serial #	Cal Code	Cal Date	Cal Due
NBLE02326	Solar	LISN, 5 uH	6338-5-PJ50N	8379521	B	02/10/2021	02/10/2022
NBLE02327	Solar	LISN, 5 uH	6338-5-PJ50N	8379522	B	02/02/2021	02/02/2022
NBLE03346	Electro-metrics	Antenna, Bicon 20-300 MHz	6912	635	G	12/12/2018	06/12/2021
NBLE03348	Electro-metrics	Antenna, Log Per. 200 MHz-1 GHz	EM-6950	724	G	11/13/2020	11/13/2022
WRLE02670	Hewlett-Packard	Preamplifier, 0.1-1300 MHz	8447D	2443A03954	B	11/10/2020	11/10/2021
WRLE10998	Rohde & Schwarz	Receiver, 20 Hz-26.5 GHz	ESU 26	100379	G	05/21/2020	05/21/2021

Cal Code G = Calibration performed by an accredited outside source.
 Cal Code B = Calibration verification performed internally.
 Cal Code Y = Passive Device, or Calibration not required when used with other calibrated equipment.



2.2 Transient Emissions

2.2.1 Specification Reference

ISO 7637-2 per UN ECE R10:2019, Sections 6.7

2.2.2 Equipment Under Test

As shown in §1.4 with modification state “0”, as noted in §1.6.

Model Number: 34044-1-000

Serial Number: 21090077M

2.2.3 Date of Test

24 March 2021

2.2.4 EUT Power

24 VDC

2.2.5 Test Method

The EUT and cable harness were setup on a non-conductive support 5cm above a copper ground plane table. The EUT power lines was connected directly to the artificial network for the slow transient emissions measurement. For the fast-transient emission measurements the EUT power lines were connected directly to the manual switch which was then connected to the artificial network. For both measurement configuration the EUT power lines has a length of 20cm (± 5 cm).

For each test setup configuration, the EUT was subjected to 10 repetitions of on/off power cycles which were controlled by the manual switch shown in the setup diagrams. Each of the 10 transient conditions were measured via oscilloscope and voltage probe, and only the worst-case measured emission recorded for the report.

Specific parameters of the test pulse were defined in ISO 7637-2 Section 4.3 as well as described in Table 2.2-1 of this test report.

During this testing any anomalies in the equipment under test’s performance were recorded.

2.2.6 Environmental Conditions

The EUT was evaluated within the climatic range of the EUT as specified by the manufacturer. When the manufacturer does not specify climatic parameters for the EUT, all tests are performed within the ambient climatic conditions of the laboratory.



2.2.7 Test Results

Table 2.2-1 – Requirements

Polarity of Pulse Amplitude	Max Allowed Pulse Amplitude	Measured Transient Max / Min Voltage	Repetitions	Test Conditions
	Vehicles w/ 24 V Systems			
Positive / Negative	+150 V / -450 V	+1.125 V / -0 V	10	Slow pulses - Switched On
Positive / Negative	+150 V / -450 V	+0 V / -0 V	10	Slow pulses - Switched Off
Positive / Negative	+150 V / -450 V	+1 V / -0 V	10	Fast pulses - Switched On
Positive / Negative	+150 V / -450 V	+0 V / -0 V	10	Fast pulses - Switched Off

Test Summary: EUT operated as intended before, during, and after testing.

Test Result: Pass

See data below for detailed results.



2.2.8 Test Screen Captures

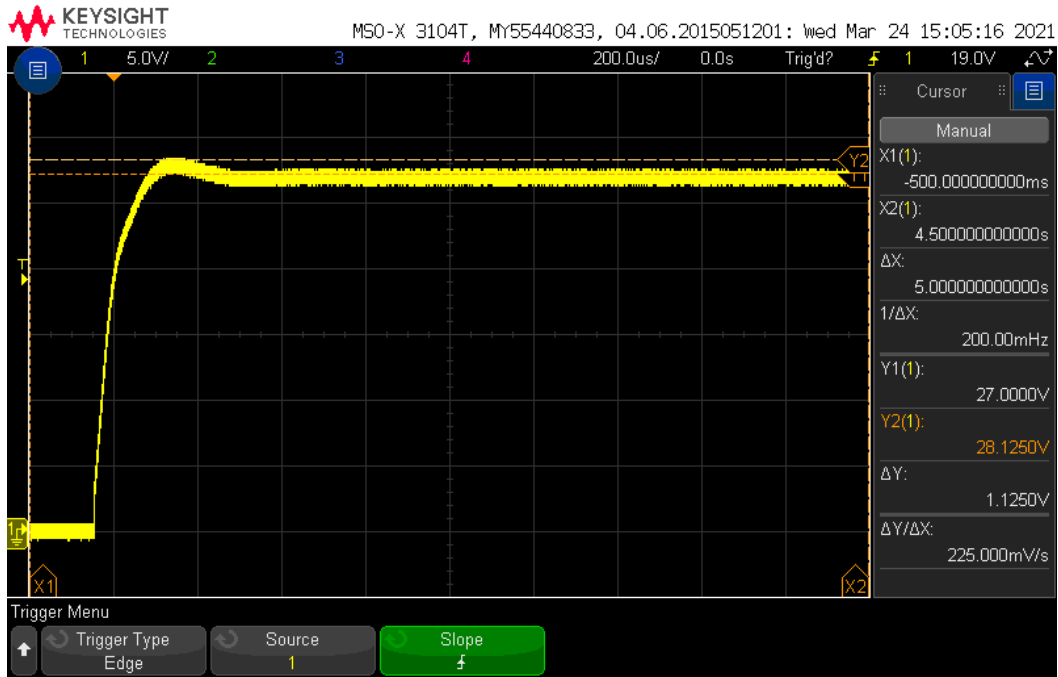


Figure 2.2-1 – Automotive EMC Directive, Annex I, 6.9 Test specification – Slow On

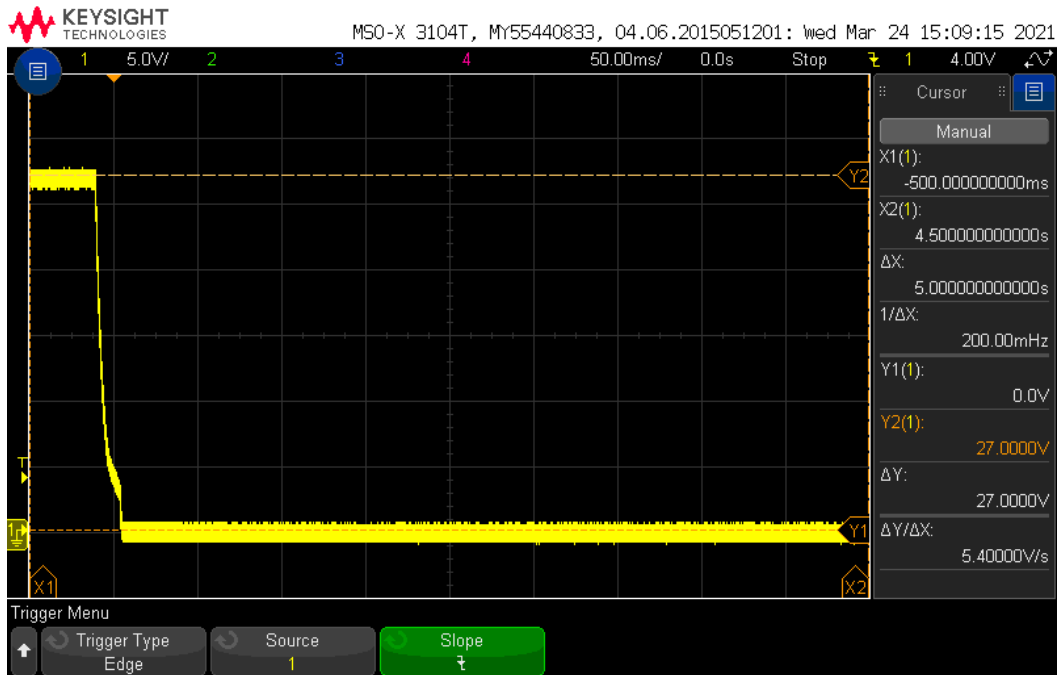


Figure 2.2-2 – Automotive EMC Directive, Annex I, 6.9 Test specification – Slow Off

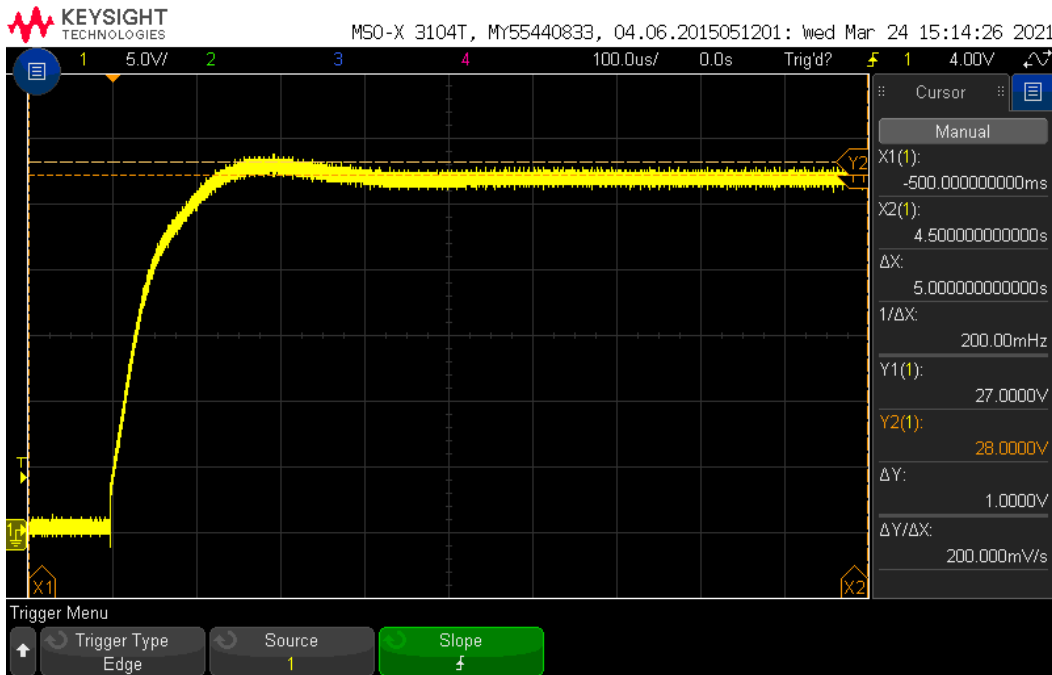


Figure 2.2-3 – Automotive EMC Directive, Annex I, 6.9 Test specification – Fast On

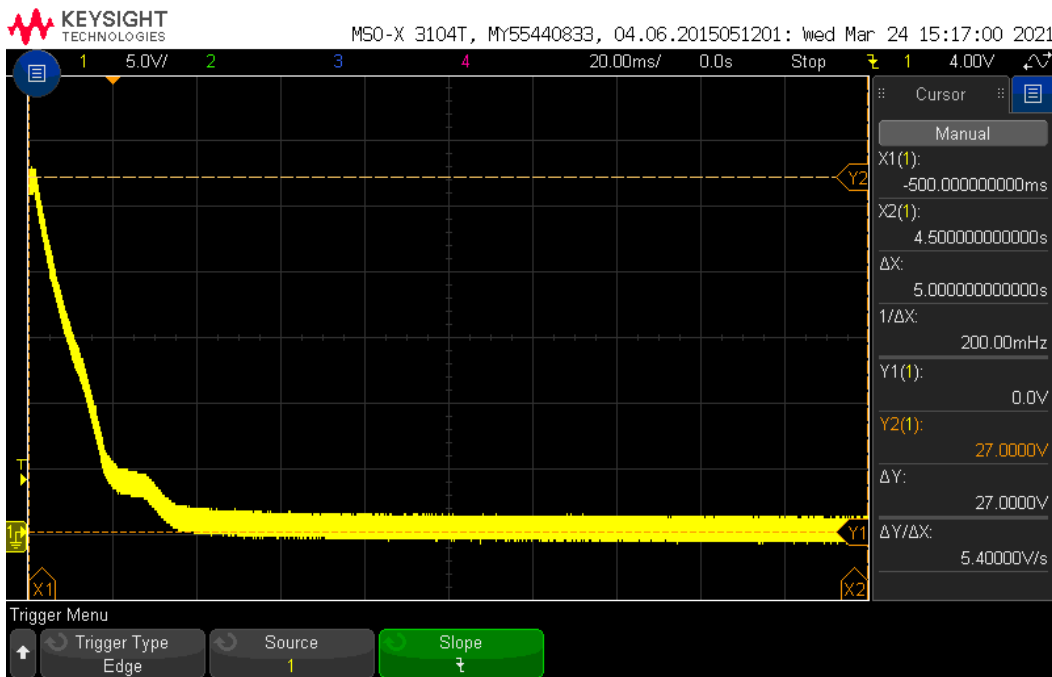


Figure 2.2-4 – Automotive EMC Directive, Annex I, 6.9 Test specification – Fast Off

2.2.9 Test Set-up Photos



Photo 2.2-1 – Transient Emission Test Setup – 34044-1-000



2.2.10 Test Location and Test Equipment Used

This test was carried out in New Brighton, MN.
Test Area: TRN1

Table 2.2-2 – Transient Emissions Equipment List

Device #	Manufacturer	Description	Model	Serial #	Cal Code	Cal Date	Cal Due
NBLE11364	Tektronix	Scope Probe, 100:1	P5100A	C005801	G	05/20/2020	05/20/2021
NBLE11408	EM Test	Battery Vltg Variation Arb Gen	AutoWave	P1551169051	B	05/18/2020	05/18/2021
NBLE11409	EM Test	Voltage Drop Simulator, TP 2b/4	VDS 200Q100	P1607181941	B	05/18/2020	05/18/2021
NBLE11410	EM Test	Transient Rack AutoWave/VDS200Q (Tall)	None	None	Y	N/A	N/A
NBLE11417	EM Test	Single line Artificial Network	AN 200N100	P1606171531	B	06/09/2020	06/09/2021
NBLE11418	EM Test	Electronic Switch for Voltage Transient	BS 200N100	P1546167410	B	12/12/2019	06/12/2021
NBLE11425	EM Test	Load Impedance for BS200N Semiconductor Switch	RS-BOX	P1605171472	B	12/12/2019	06/12/2021
NBLE11428	Keysight Technologies	Oscilloscope, 4-CH	MSO-X 3104T	MY55440833	G	05/18/2020	05/18/2021

Cal Code G = Calibration performed by an accredited outside source.

Cal Code B = Calibration verification performed internally.

Cal Code Y = Passive Device, or Calibration not required when used with other calibrated equipment.



2.3 Radiated Immunity Tests

2.3.1 Specification Reference

ISO 11452-2 per UN ECE R10:2019, Section 6.8

2.3.2 Equipment Under Test

As shown in §1.4 with modification state “0”, as noted in §1.6.

2.3.3 Date of Test

23 and 24 March 2021

2.3.4 EUT Power

24 VDC

2.3.5 Test Method

The EUT was setup in a semi-anechoic chamber and laid on a non-conductive support 5cm above a copper ground plane table with a height of 90cm (± 10 cm). The EUT was placed 20cm from the front edge of the ground plane while the stretched-out cable bundle was 10cm from the front edge. Each transmit antenna had a height of 10cm above the ground plane table and a measurement distance of 1m from the front edge of the routed cabling. For the frequency range of 20-1000 MHz the antenna was centered on the test setup and focused on the cable bundle, while for frequencies above 1 GHz a horn antenna was centered on the EUT enclosure.

Prior to testing each applicable frequency range, a field strength calibration was performed for both vertical and horizontal antenna orientations. During the calibration an isotropic field probe was placed within the antenna beamwidth and the RF field was increased until the required field strength was measured. Once the required field strength was measured the forward power was recorded for test playback. This procedure was performed each frequency step within the required frequency range.

During testing each frequency step was increased in amplitude until the calibrated forward power is reached. Once the forward power is reached the frequency is set to dwell at that RF amplitude for a minimum of 2sec. This process is repeated for each frequency within the required range(s), then again for each required modulation type. The whole process is performed in both horizontal and vertical transmit antenna orientations. See Table 2.3-2 for exact step sizes, dwell times, and modulations used during testing

During this testing any anomalies in the equipment under test's performance were recorded.

2.3.6 Environmental Conditions

The EUT was evaluated within the climatic range of the EUT as specified by the manufacturer. When the manufacturer does not specify climatic parameters for the EUT, all tests are performed within the ambient climatic conditions of the laboratory.



2.3.7 Test Results

Table 2.3-1 – Requirements

Required Test Levels					Performance Criteria
Frequency Range (MHz)	Level (V/m)	Modulation	Step Size (%)	Dwell (s)	
20 to 400	30	AM (80 %,1 kHz, sine wave)	5 %	2	A
400 to 800	30	AM (80 %,1 kHz, sine wave)	2 %	2	A
800 to 2000	30	PM (on = 577µsec, period = 4.6msec)	2 %	2	A
Supplementary information:					

Table 2.3-2 – Observations During Testing

Actual Test Levels					Criteria Met
Frequency Range (MHz)	Level (V/m)	Modulation	Step Size (%)	Dwell (s)	
20 to 400	30	AM (80 %,1 kHz, sine wave)	5 %	2	A
400 to 1000	30	AM (80 %,1 kHz, sine wave)	2 %	2	A
800 to 2000	30	PM (on = 577µsec, period = 4.6msec)	2 %	2	A
Supplementary information:					
Testing was performed in both Vertical and Horizontal polarizations.					

Test Summary: The EUT showed no signs of susceptibility during testing.

Test Result: Pass

2.3.8 Test Set-up Photo

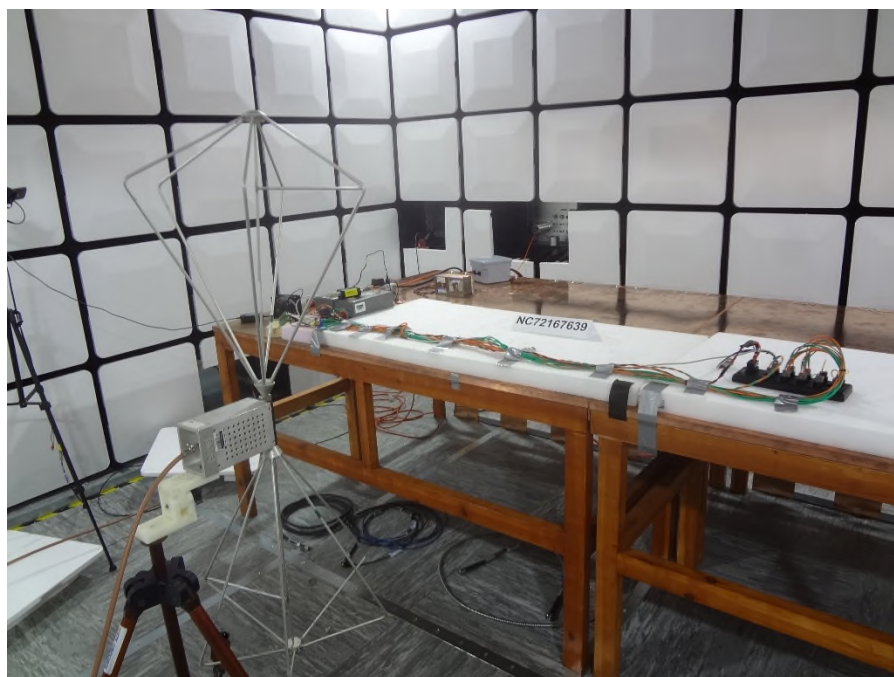


Photo 2.3-1 – Radiated Immunity Test Set-up – 20-200 MHz - Model 34044-1-000



Photo 2.3-2 – Radiated Immunity Test Set-up – 200-1000 MHz - Model 34044-1-000

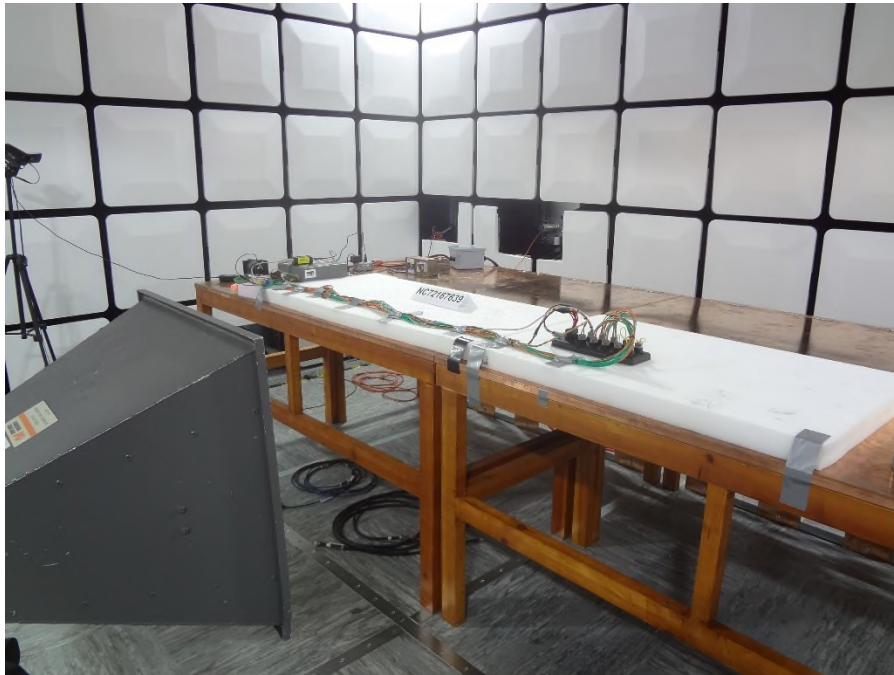


Photo 2.3-3 – Radiated Immunity Test Set-up – 1-2 GHz - Model 34044-1-000

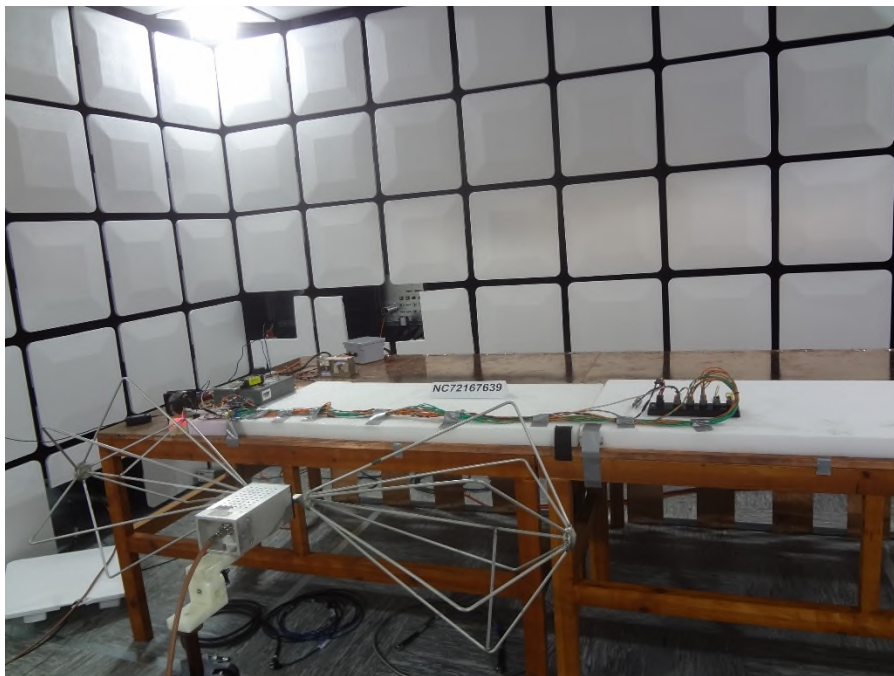


Photo 2.3-4 – Radiated Immunity Test Set-up – 20-200 MHz - Model 34044-1-100



Photo 2.3-5 – Radiated Immunity Test Set-up – 200-1000 MHz - Model 34044-1-100



Photo 2.3-6 – Radiated Immunity Test Set-up – 1-2 GHz - Model 34044-1-100



Photo 2.3-7 – Radiated Immunity Test Set-up – 20-200 MHz - Model 34044-1-200

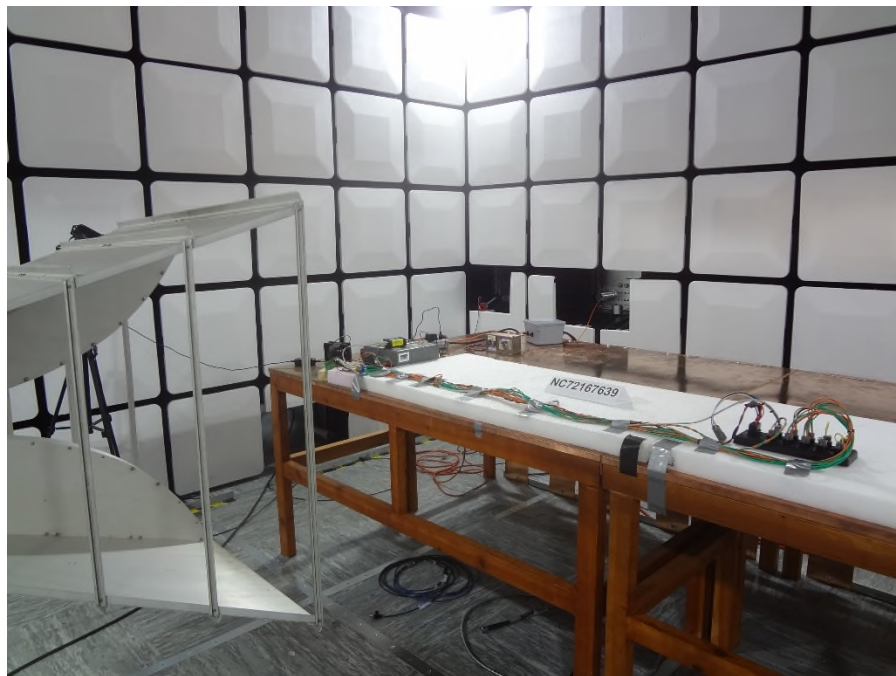


Photo 2.3-8 – Radiated Immunity Test Set-up – 200-1000 MHz - Model 34044-1-200



Photo 2.3-9 – Radiated Immunity Test Set-up – 1-2 GHz - Model 34044-1-200



2.3.9 Test Location and Test Equipment Used

This test was carried out in New Brighton, MN.
Test Area: SAC2

Table 2.3-3 – Electromagnetic Field Immunity Equipment List

Device #	Manufacturer	Description	Model	Serial #	Cal Code	Cal Date	Cal Due
NBLE02065	Werlatone	Coupler, 40dB 80-1000 MHz	C3910-10	29512	B	10/30/2020	10/30/2021
NBLE02326	Solar	LISN, 5 uH	6338-5-PJ50N	8379521	B	02/10/2021	02/10/2022
NBLE02327	Solar	LISN, 5 uH	6338-5-PJ50N	8379522	B	02/02/2021	02/02/2022
NBLE02355	Tensor	Antenna, 200 MHz-2 GHz	4106	2014	G	08/13/2020	08/13/2022
NBLE02929	EMCO/EMC Test	Antenna, High Field Biconical	3109	9710-3123	Y	N/A	N/A
NBLE10370	Amplifier Research	Antenna, Horn 1-4.2 GHz	AT4510	27652	Y	N/A	N/A
NBLE11152	Amplifier Research	Coupler, 50dB	DC2500	14846	B	10/31/2020	10/31/2021
NBLE11340	Amplifier Research	Amplifier, 10 kHz-225 MHz	2500A225	341989	Y	N/A	N/A
NBLE11429	Amplifier Research	Amplifier, 80-1000 MHz	250W1000B	346080	Y	N/A	N/A
NBLE11453	ETS-Lindgren	Field Probe	HI-6053	140112	G	04/27/2020	04/27/2021
NBLE11498	Werlatone	Coupler, 40dB 700 MHz-6 GHz	C10117-10	113105	B	09/03/2020	09/03/2021
NBLE11499	Milmega	Amplifier, 1-6 GHz	AS2560-50	1021555	Y	N/A	N/A
WRLE10435	Agilent Technologies	Spectrum Analyzer	E4440A	MY44303483	G	10/12/2020	10/12/2021
NBLE11585	Rohde & Schwarz	Signal Generator, 9 kHz-6 GHz	SMA100A	102106	G	08/19/2020	08/19/2021

Cal Code G = Calibration performed by an accredited outside source.

Cal Code B = Calibration verification performed internally.

Cal Code Y = Passive Device, or Calibration not required when used with other calibrated equipment.



2.4 Immunity to Conducted Transients on Power Leads

2.4.1 Specification Reference

ISO 7637-2:2004 per UN ECE R10:2019, Section 6.9

2.4.2 Equipment Under Test and Modification State

As shown in §1.4 with modification state “0”, as noted in §1.6.

Model Number: 34044-1-000

Serial Number: 21090077M

2.4.3 Date of Test

24 March 2021

2.4.4 EUT Power

24 VDC all tests, Tip 4 12 and 24 VDC

2.4.5 Test Method

The EUT was setup on a conductive test bench 50 mm (± 10 mm) above the ground plane on top of an insulating support.

Prior to testing each applicable transient was verified open circuit. Once verified, the EUT was connected to the transient generator, and the test was performed. EUT functioning was monitored throughout the test and a post-test functional test was performed.

During this testing any anomalies in the equipment under test's performance were recorded.

2.4.6 Environmental Conditions

The EUT was evaluated within the climatic range of the EUT as specified by the manufacturer. When the manufacturer does not specify climatic parameters for the EUT, all tests are performed within the ambient climatic conditions of the laboratory.



2.4.7 Test Results

Table 2.4-1 – Requirements

Pulse (24 V System)	Level	Severity (Volts)	Functional Status for Systems	
			Related to Immunity Functions	Not Related to Immunity Functions
1	III	-450	C	D
2a	III	+37	B	D
2b	III	+20	C	D
3a	III	-150	A	D
3b	III	+150	A	D
4 (Operational During Engine Start Phases)	III	-12	B	D
4 (All Other ESA)	III	-12	C	D
Pulse (12 V System)				
4 (Operational During Engine Start Phases)	III	-6	B	D
4 (All Other ESA)	III	-6	C	D

Table 2.4-2 – Summary of Observations During Testing

Pulse 24 V System	Level	Severity	Required Status	Severity Achieved	# of Pulses / Duration	Status Met
1	III	-450 V	C	-450 V	5000 pulses	A
2a	III	+37 V	B	+37 V	5000 pulses	A
2b	III	+20 V	C	+20 V	10 pulses	A
3a	III	-150 V	A	-150 V	1 hour	A
3b	III	+150 V	A	+150 V	1 hour	A
4	III	-12 V	C	-12 V	3 pulses	A
Pulse 12 V System						
4	III	-6 V	C	-6 V	3 pulses	A

Notes:
Testing was performed in Operating Mode.

Test Summary: EUT operated as intended before, during, and after testing.

Test Result: Pass



2.4.7.1 Test Pulse 1

Table 2.4-3 – Test Pulse 1 Parameters

TEST VOLTAGE (VOLTS)	TEST LEVEL (VOLTS)	PULSE WIDTH (mSec)	PULSE PERIOD (Sec)	SOURCE IMPEDANCE (OHMS)	REPETITIONS
27	-450	1	0.50	50	5000

Table 2.4-4 – Observations During Test

EUT Power / Configuration	Result	Observation
27 VDC	Pass	EUT LEDs blinked with every transient indicating a constant EUT reset throughout the test. Normal operation returned at test conclusion as designed.

Test Summary: EUT LEDs blinked with every transient indicating a constant EUT reset throughout the test. Normal operation returned at test conclusion as designed.

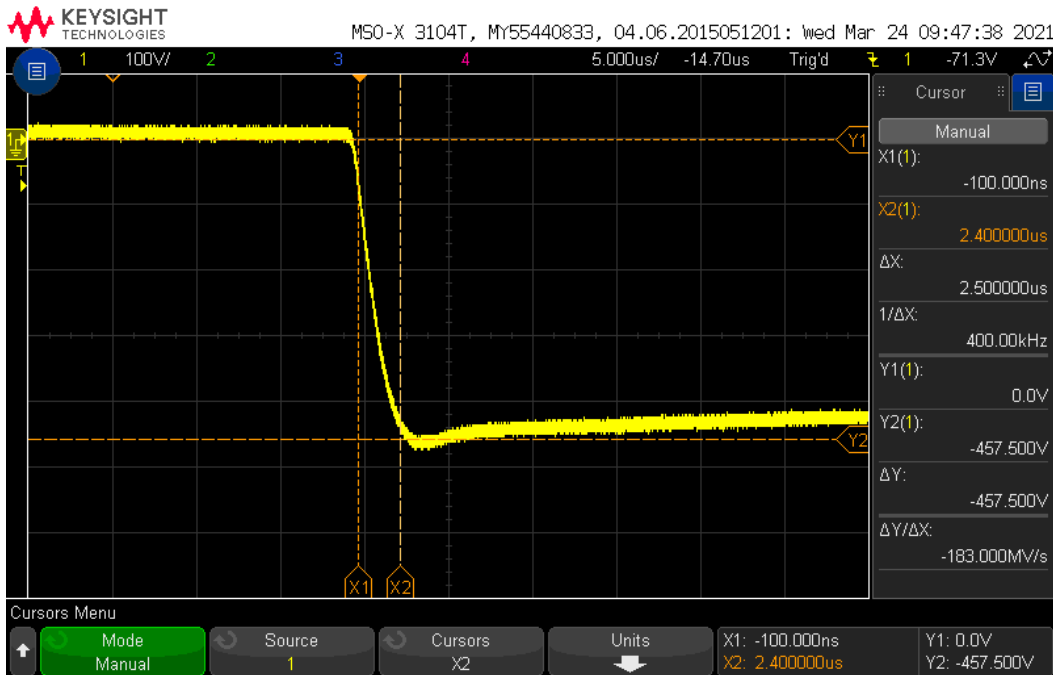


Figure 2.4-1 – Pulse 1 – Tr, T3, & Us – Open Circuit

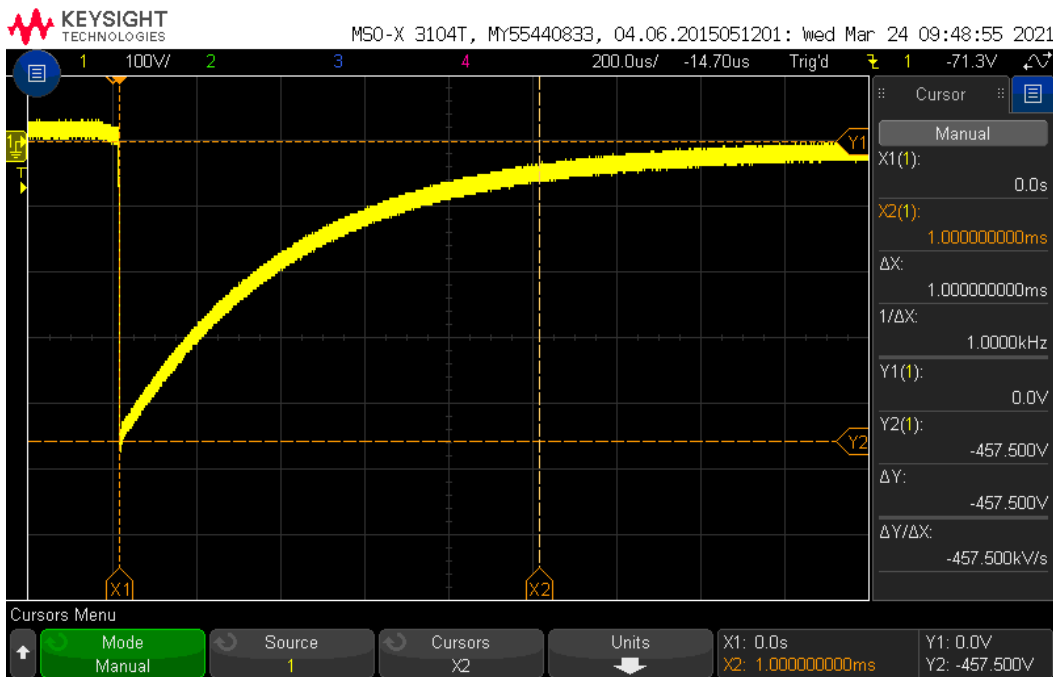


Figure 2.4-2 – Pulse 1 – Td – Open Circuit

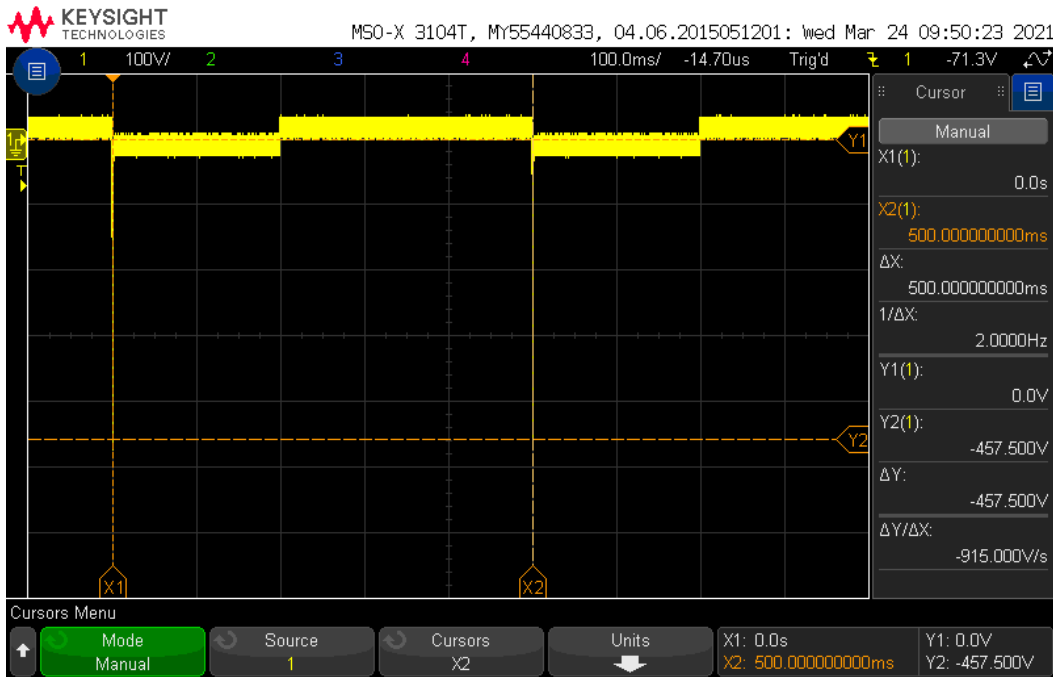


Figure 2.4-3 – Pulse 1 – T1 & T2 – Open Circuit

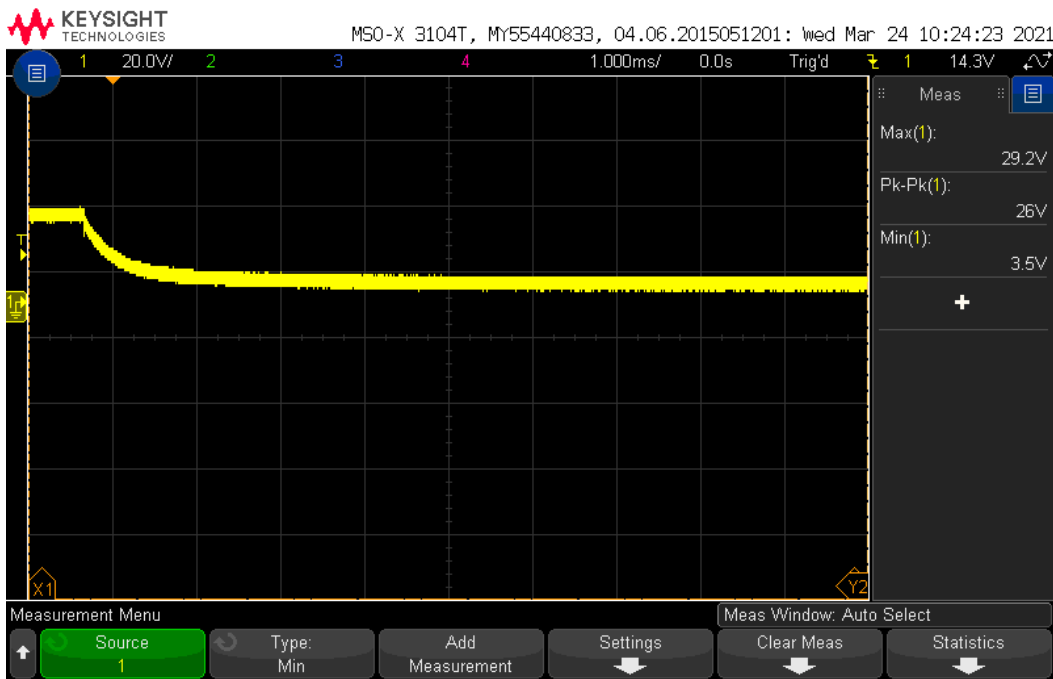


Figure 2.4-4 – Pulse 1 – Td – EUT

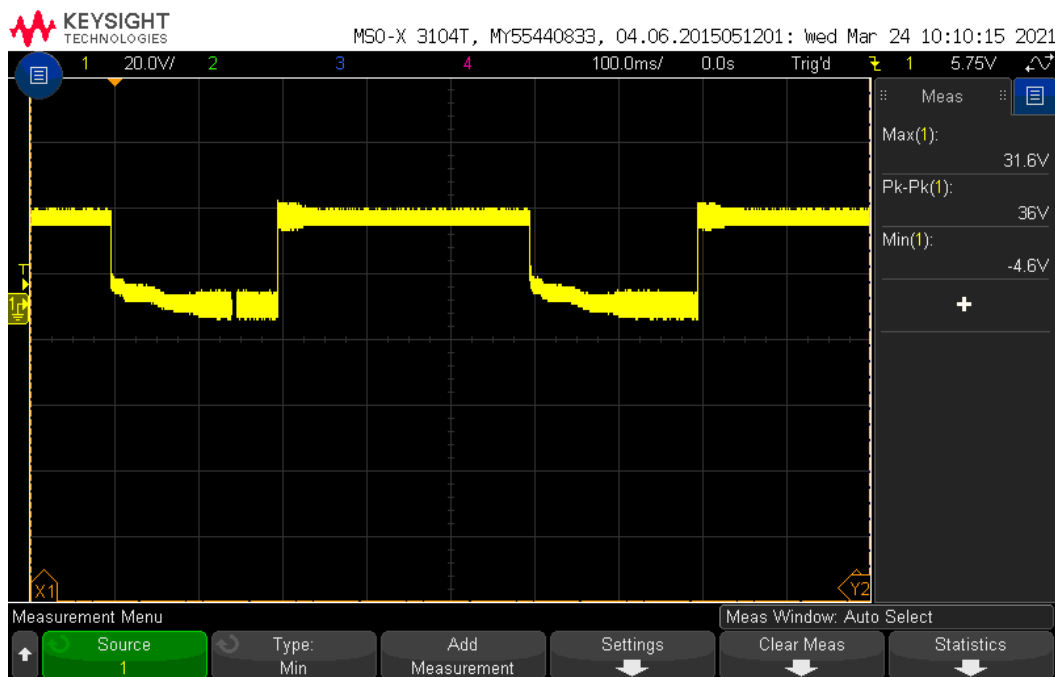


Figure 2.4-5 – Pulse 1 – T1 & T2 – EUT



2.4.7.2 Test Pulse 2a

Table 2.4-5 – Test Pulse 2a Parameters

TEST VOLTAGE (VOLTS)	TEST LEVEL (VOLTS)	PULSE WIDTH (mSec)	PULSE PERIOD (Sec)	SOURCE IMPEDANCE (OHMS)	REPETITIONS
27	+37	0.05	0.50	2	5000

Table 2.4-6 – Observations During Testing

EUT Power / Configuration	Result	Observation
27 VDC	Pass	The EUT showed no signs of susceptibility during testing.

Test Summary: The EUT showed no signs of susceptibility during testing.

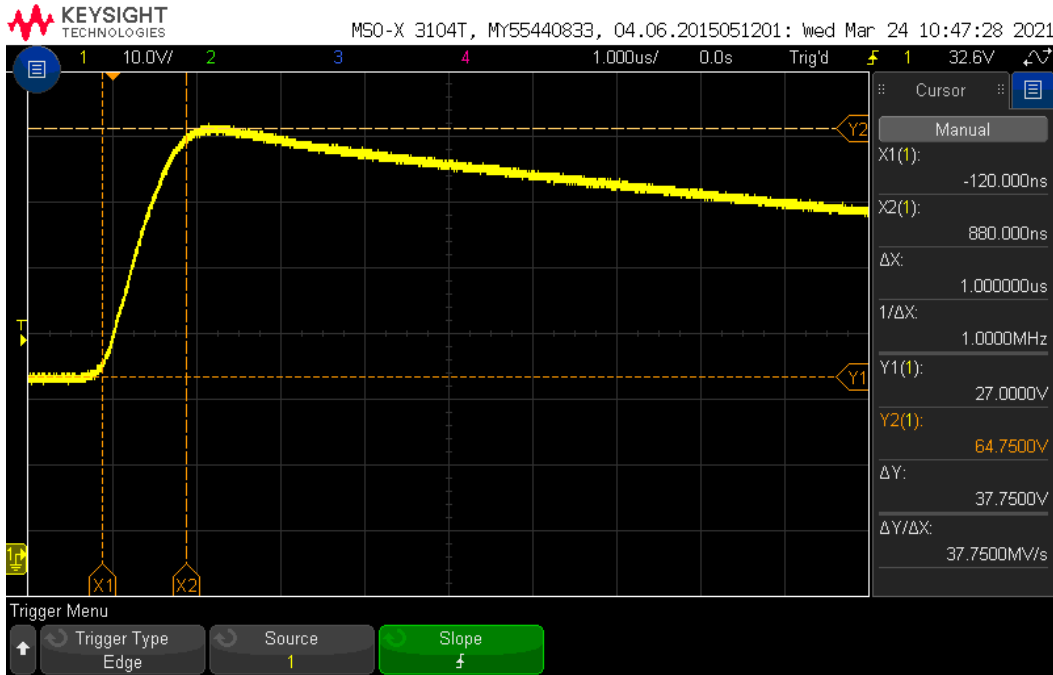


Figure 2.4-6 – Pulse 2a – Tr – Open Circuit

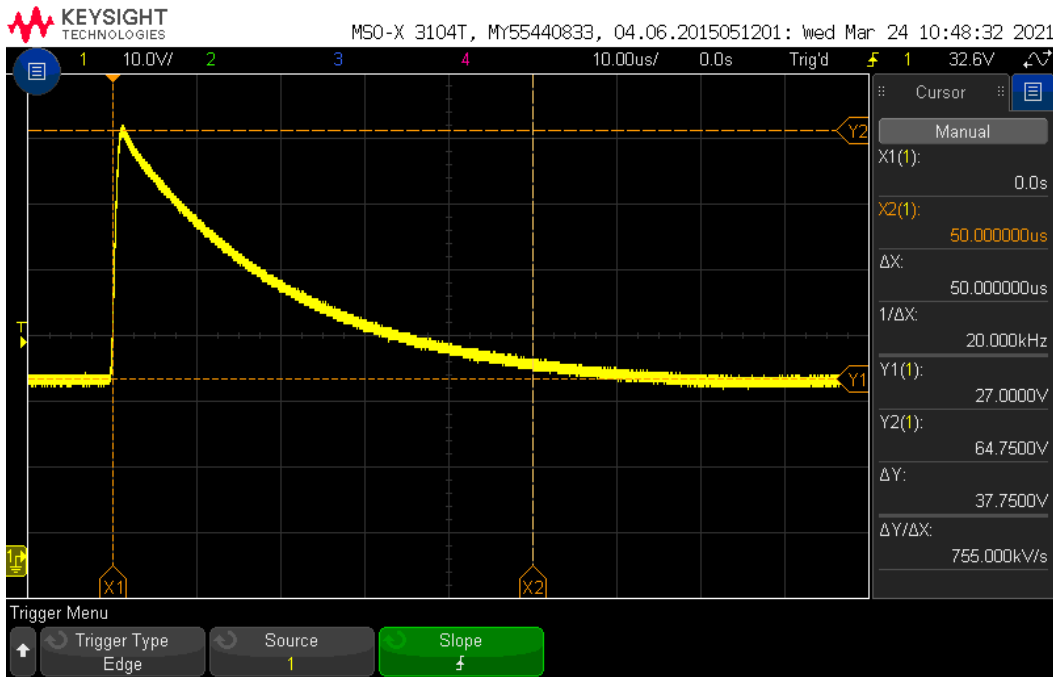


Figure 2.4-7 – Pulse 2a – Td – Open Circuit

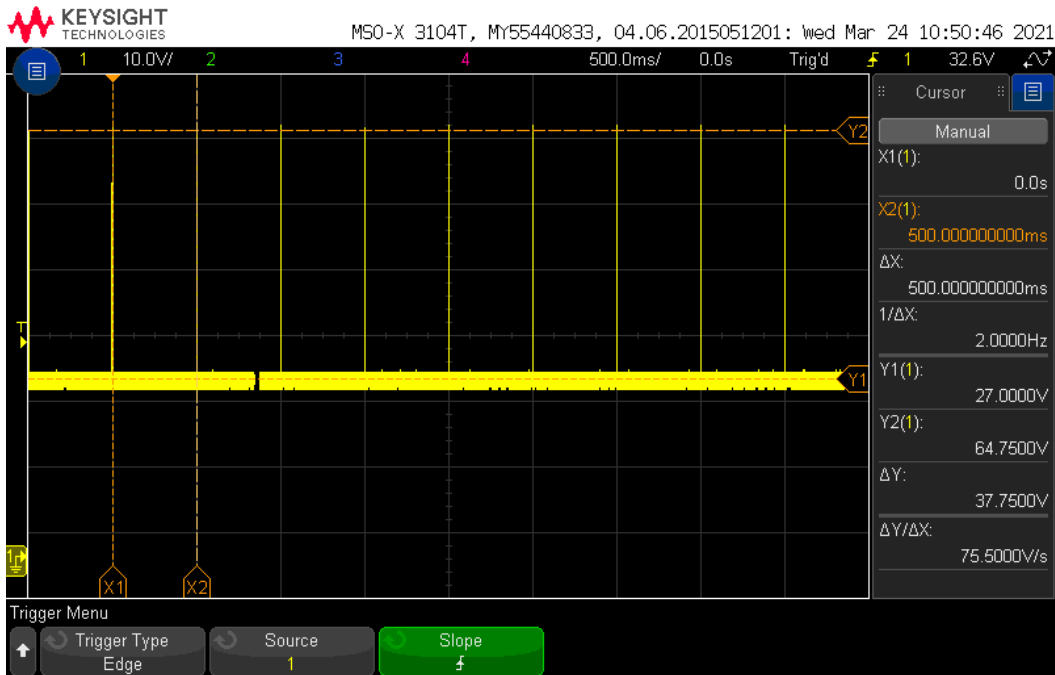


Figure 2.4-8 – Pulse 2a – T1 – Open Circuit

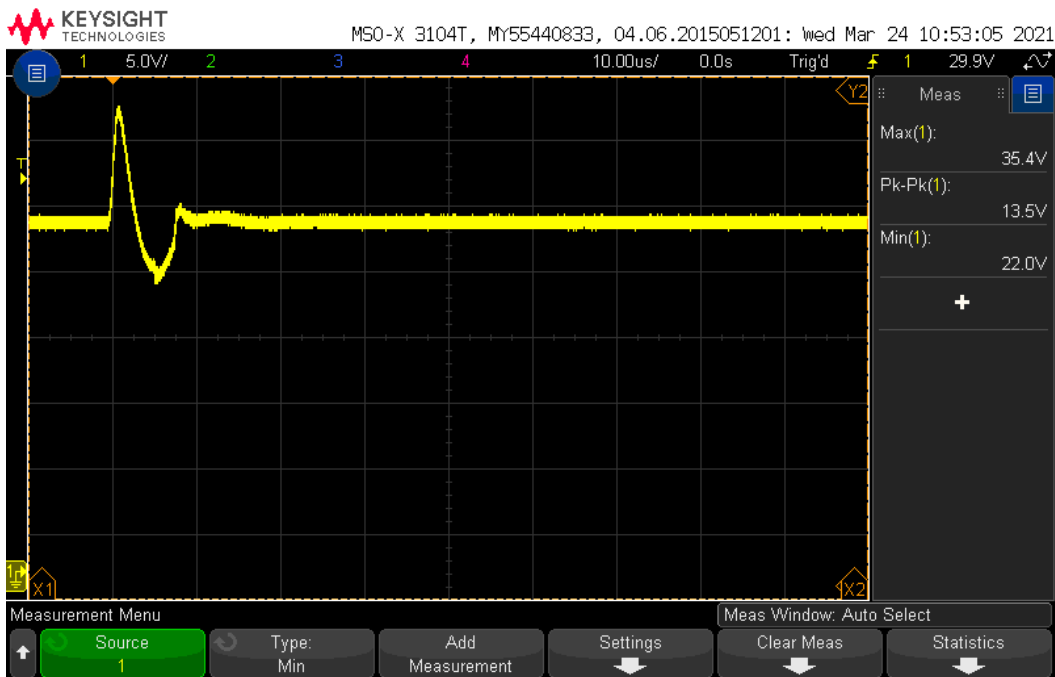


Figure 2.4-9 – Pulse 2a – Tr & Td – EUT

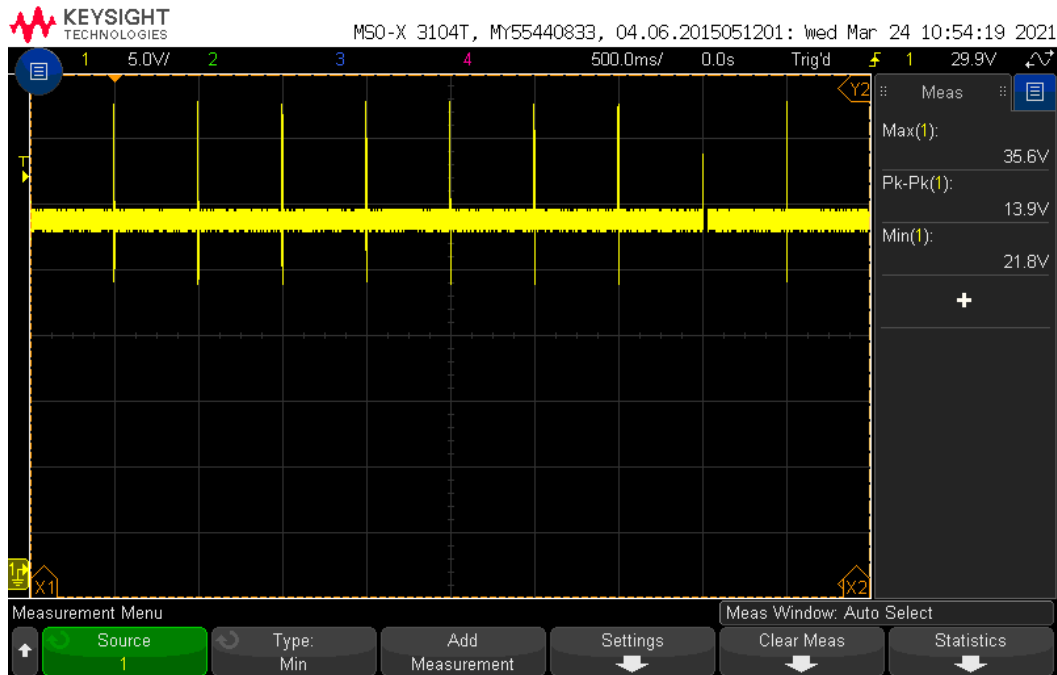


Figure 2.4-10 – Pulse 2a – T1 – EUT



2.4.7.3 Test Pulse 2b

Table 2.4-7 – Test Pulse 2b Parameters

TEST VOLTAGE (VOLTS)	TEST LEVEL (VOLTS)	PULSE WIDTH (Sec)	REP RATE (Sec)	SOURCE IMPEDANCE (OHMS)	REPETITIONS
27	20	2	5	0	10

Table 2.4-8 – Observations During Testing

EUT Power / Configuration	Result	Observation
27 VDC	Pass	The EUT reset for each applied test pulse, normal operation returned after test completion as designed.

Test Summary: The EUT reset for each applied test pulse, normal operation returned after test completion as designed.

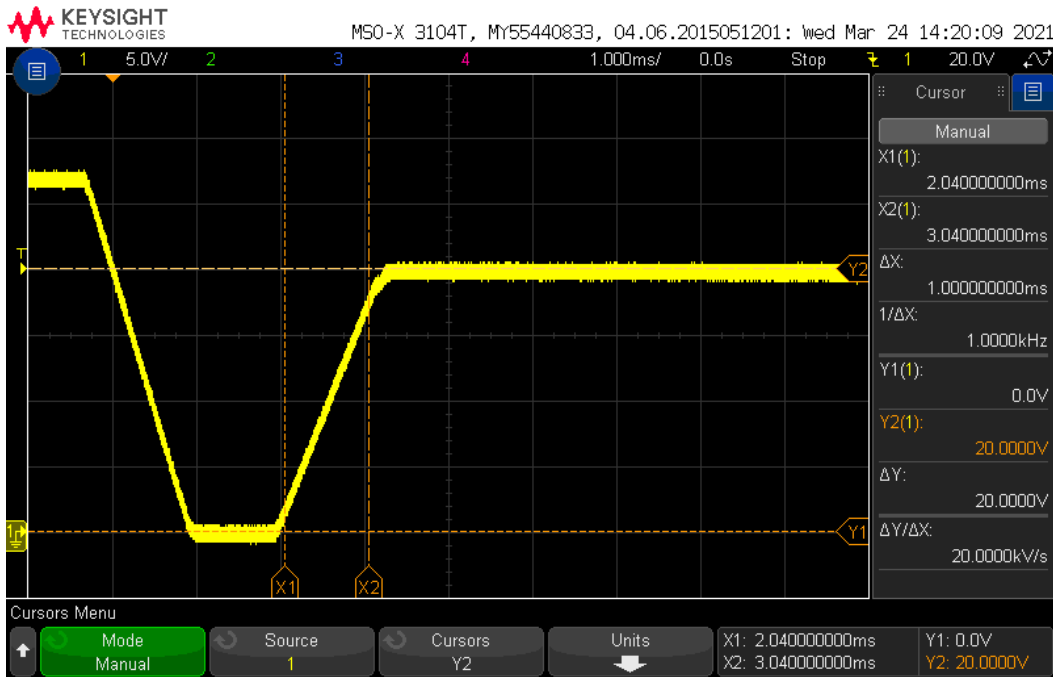


Figure 2.4-11 – Pulse 2b – Tr – Open Circuit

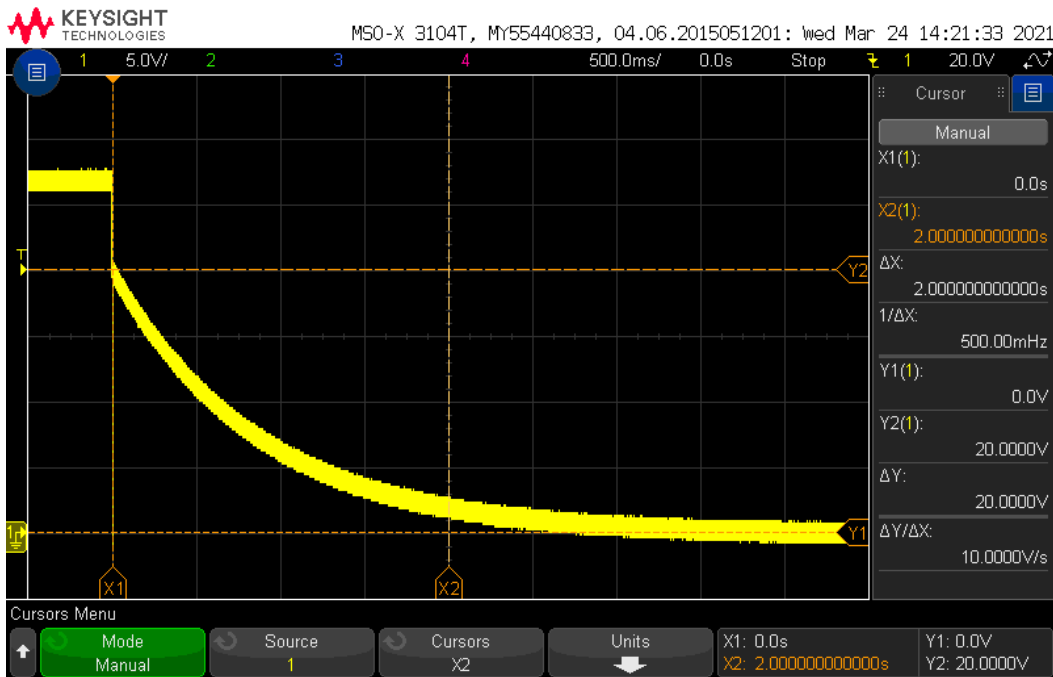


Figure 2.4-12 – Pulse 2b – Td – Open Circuit

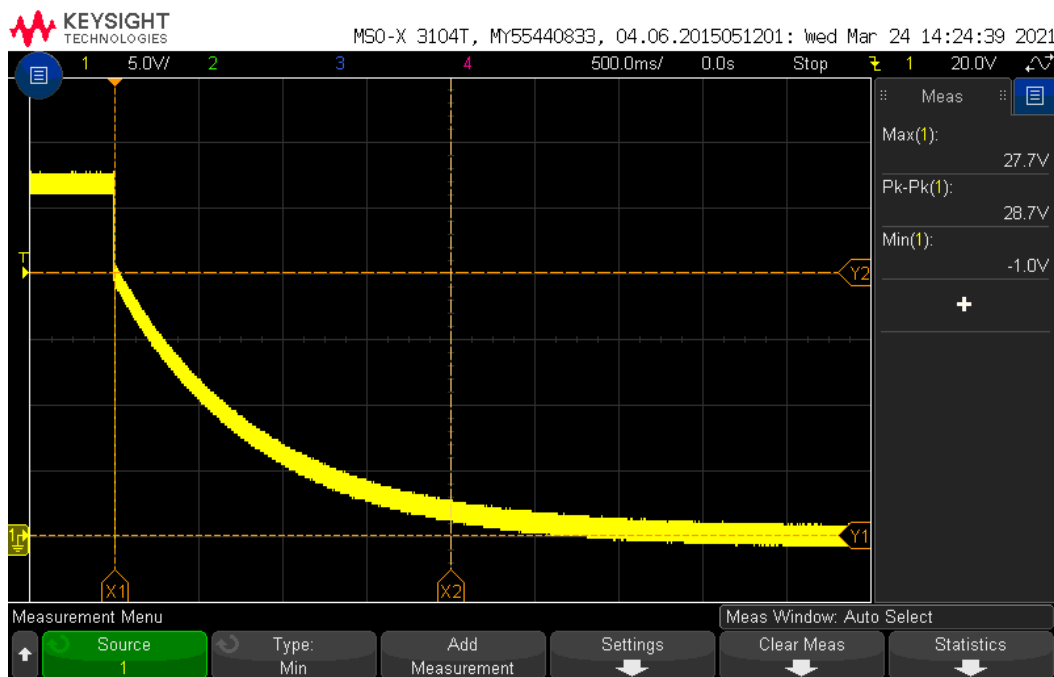


Figure 2.4-13 – Pulse 2b – Td – EUT



2.4.7.4 Test Pulse 3a

Table 2.4-9 – Test Pulse 3a Parameters

TEST VOLTAGE (VOLTS)	TEST LEVEL (VOLTS)	REP RATE (µSec)	BURST WIDTH (mSec)	BURST PERIOD (mSec)	SOURCE IMPEDANCE (OHMS)	TEST TIME (MIN)
27	-150	100	10	100	50	60

Table 2.4-10 – Observations During Testing

EUT Power / Configuration	Result	Observation
27 VDC	Pass	The EUT showed no signs of susceptibility during testing.

Test Summary: The EUT showed no signs of susceptibility during testing.

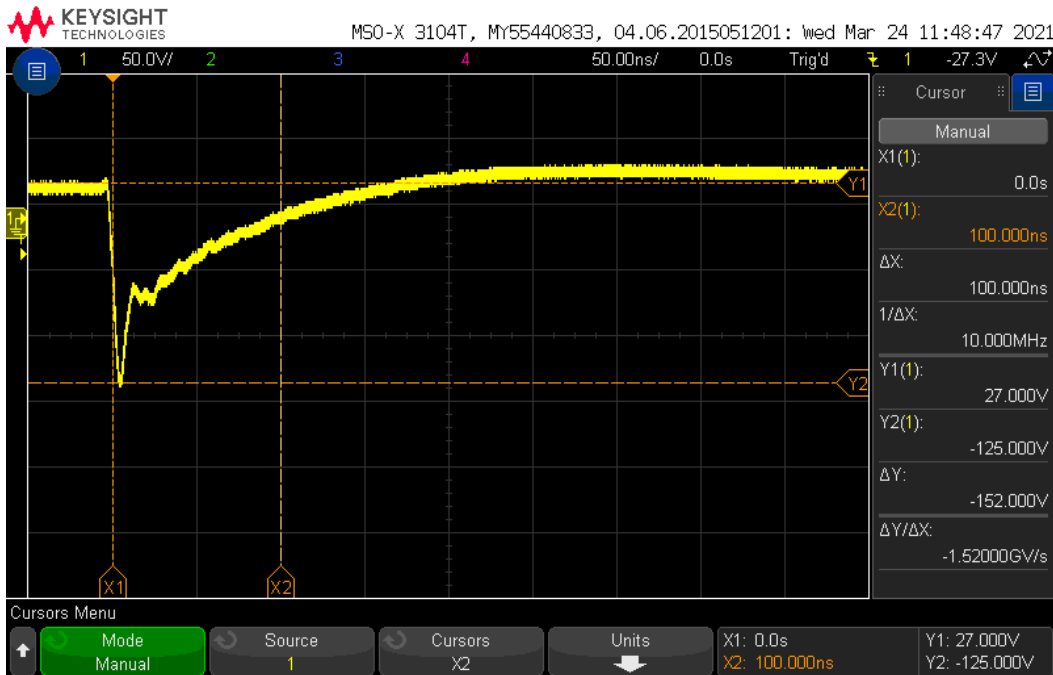


Figure 2.4-14 – Pulse 3a – Tr & Td – Open Circuit

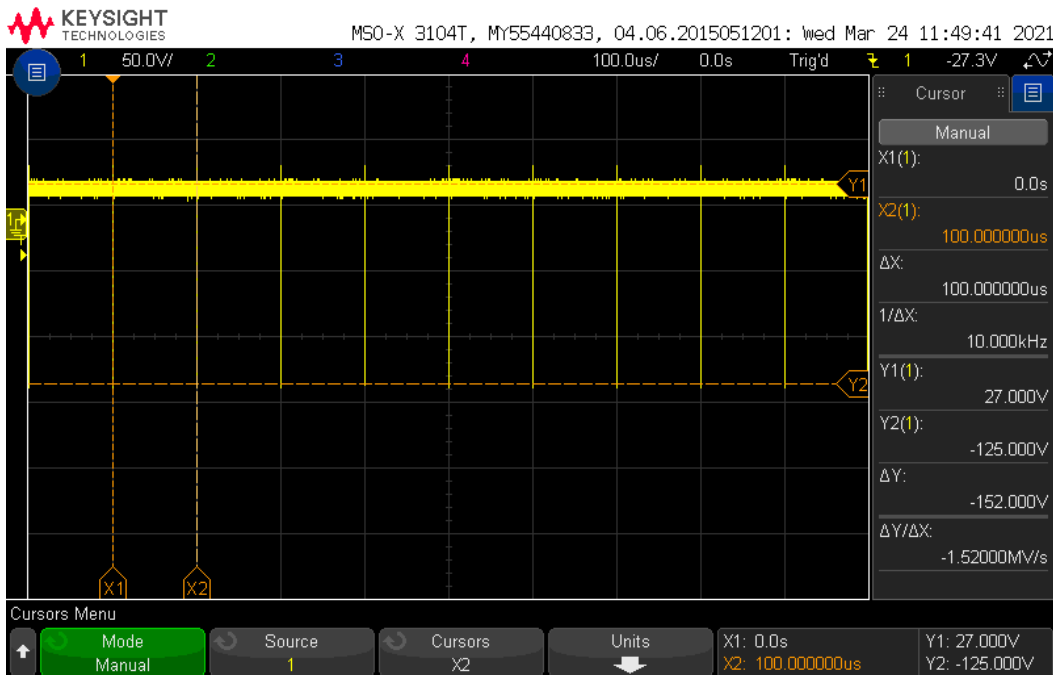


Figure 2.4-15 – Pulse 3a – T1 – Open Circuit

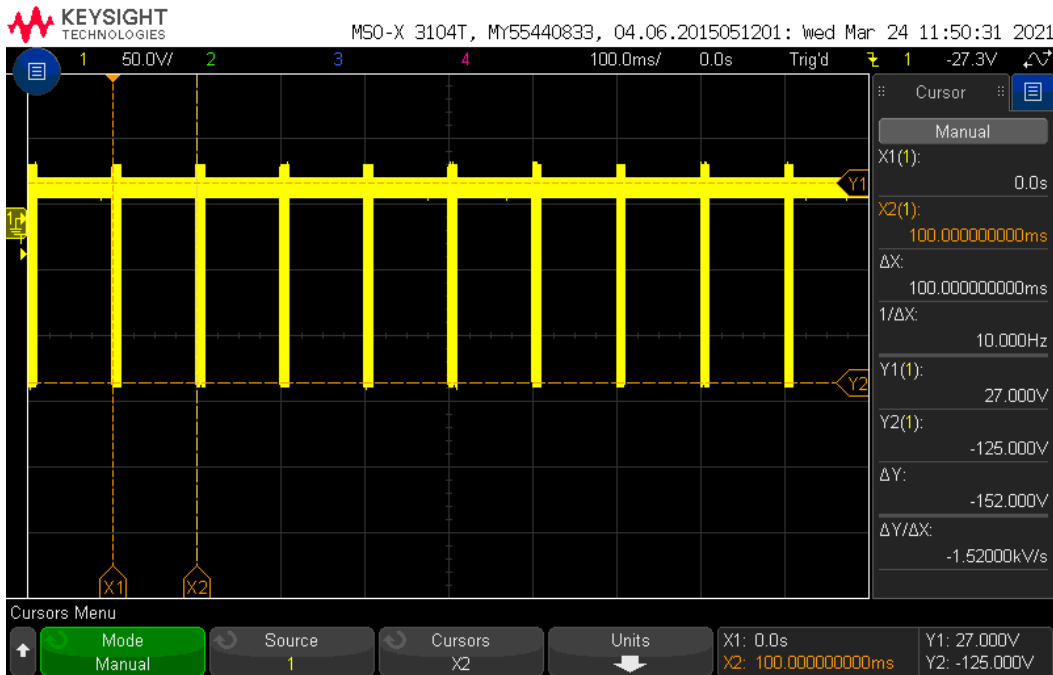


Figure 2.4-16 – Pulse 3a – T4 & T5 – Open Circuit

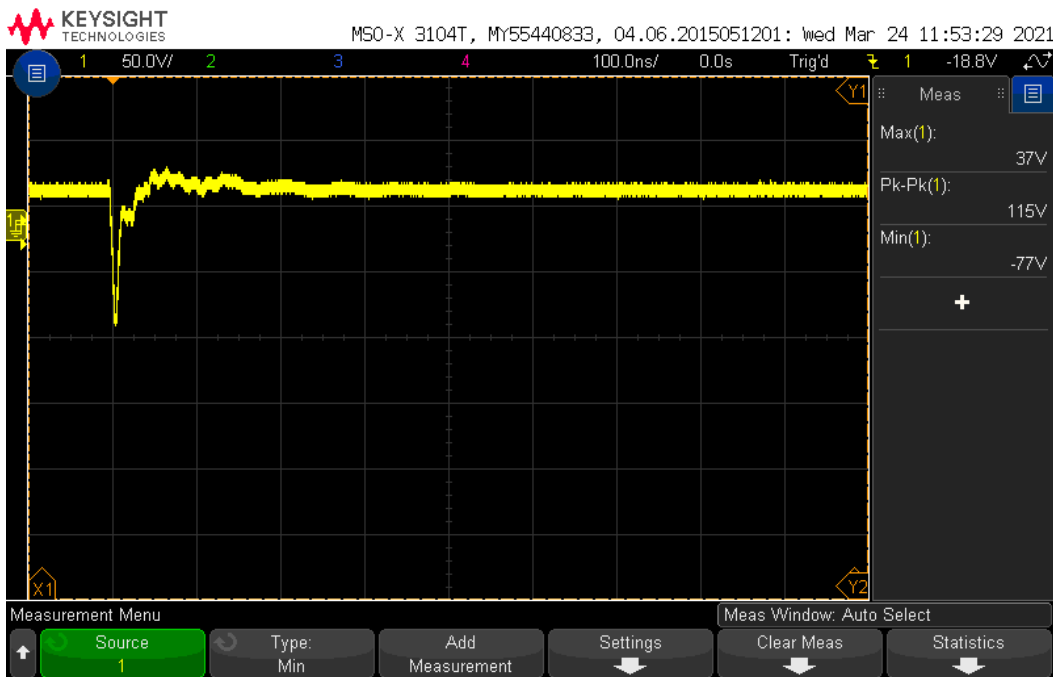


Figure 2.4-17 – Pulse 3a – Tr & Td – EUT

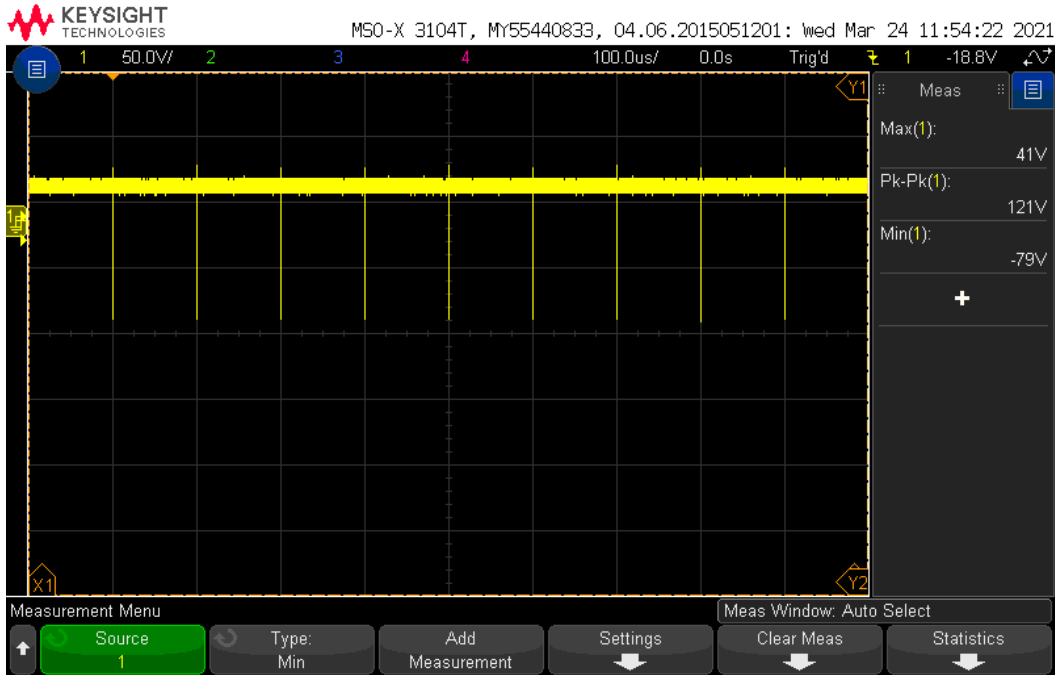


Figure 2.4-18 – Pulse 3a – T1 – EUT

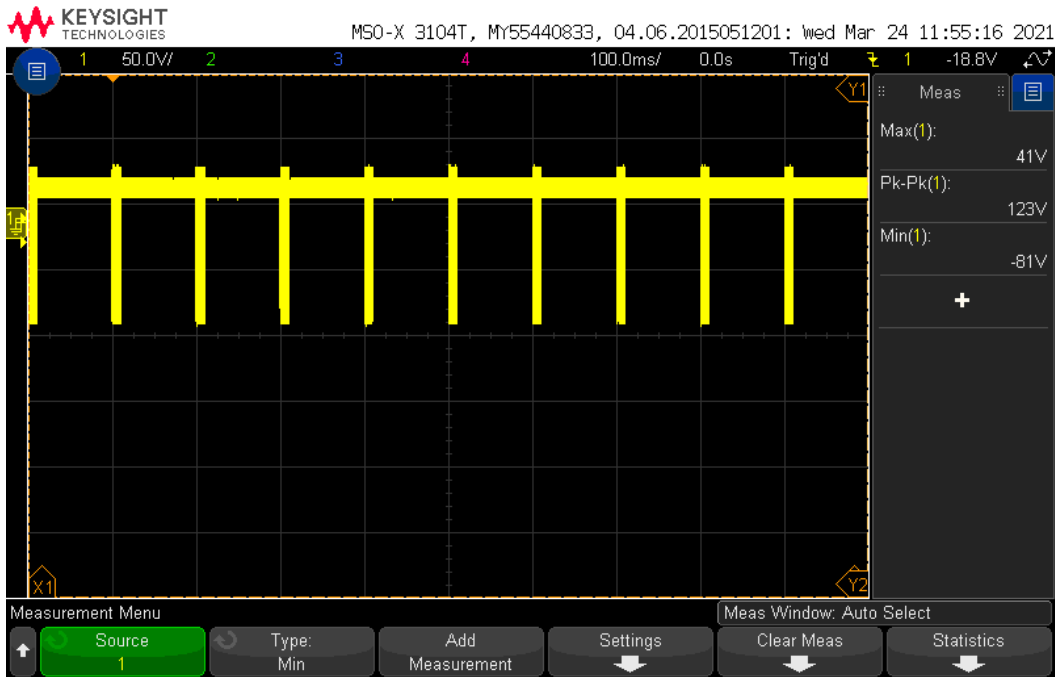


Figure 2.4-19 – Pulse 3a – T4 & T5 – EUT



2.4.7.5 Test Pulse 3b

Table 2.4-11 – Test Pulse 3b Parameters

TEST VOLTAGE (VOLTS)	TEST LEVEL (VOLTS)	REP RATE (µSec)	BURST WIDTH (mSec)	BURST PERIOD (mSec)	SOURCE IMPEDANCE (OHMS)	TEST TIME (MIN)
27	+150	100	10	100	50	60

Table 2.4-12 – Observations During Testing

EUT Power / Configuration	Result	Observation
27 VDC	Pass	The EUT showed no signs of susceptibility during testing.

Test Summary: The EUT showed no signs of susceptibility during testing.

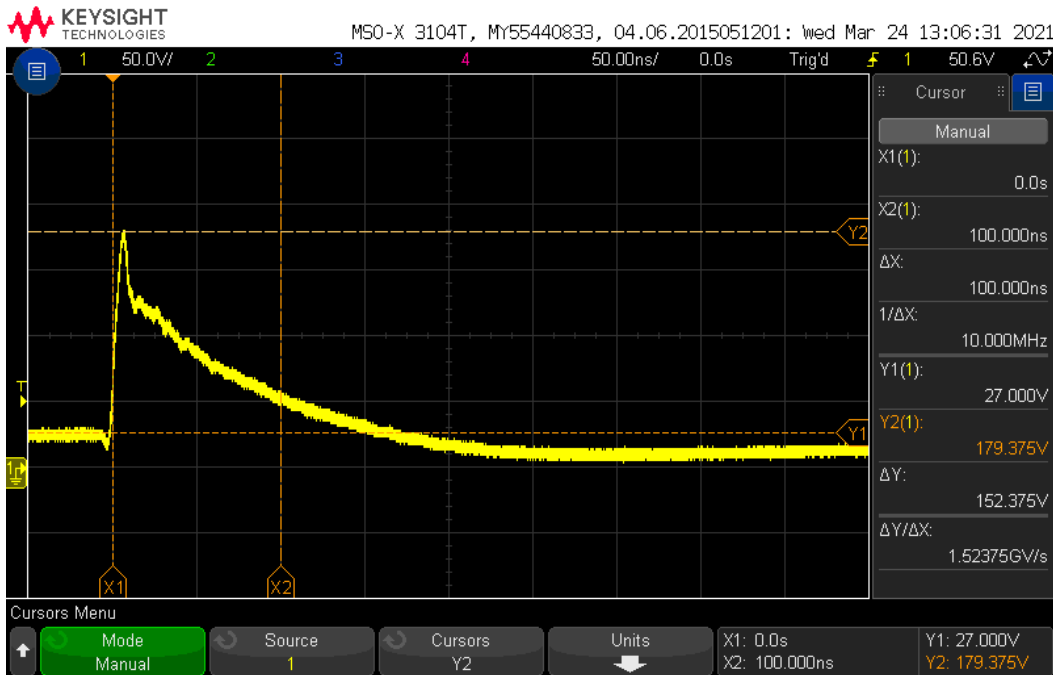


Figure 2.4-20 – Pulse 3b – Tr & Td – Open Circuit

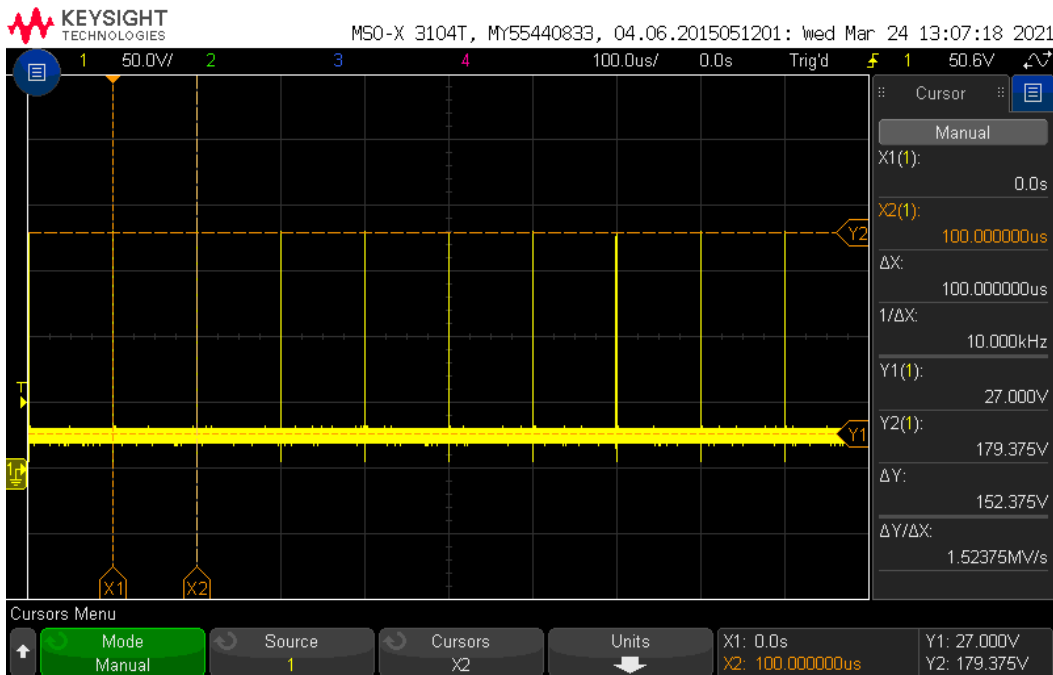


Figure 2.4-21 – Pulse 3b – T1 – Open Circuit

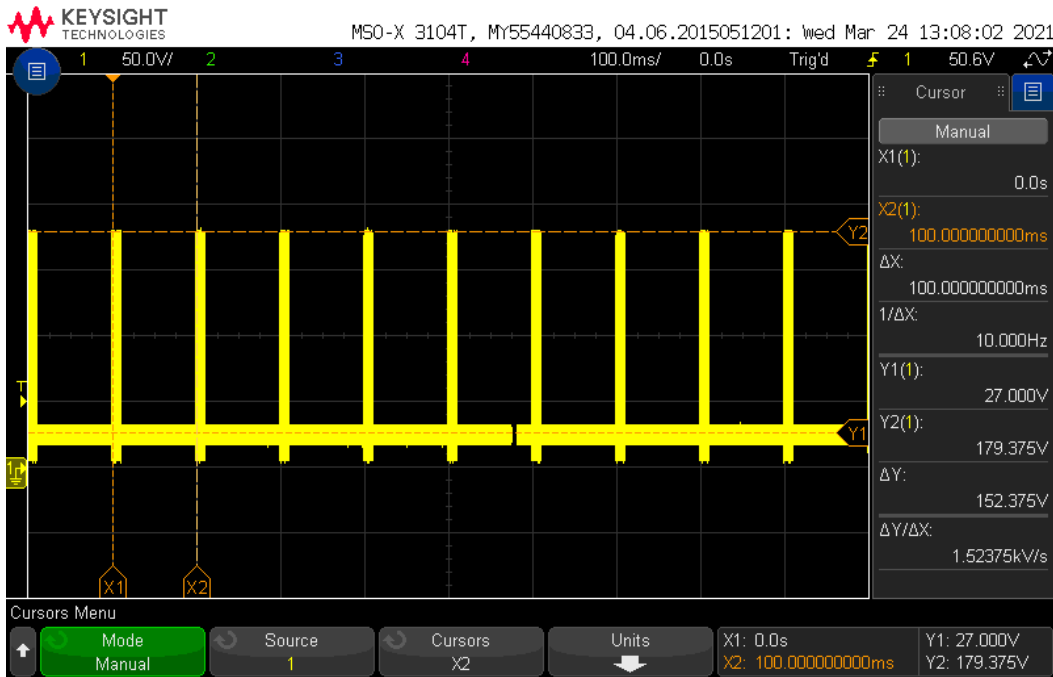


Figure 2.4-22 – Pulse 3b – T4 & T5 – Open Circuit

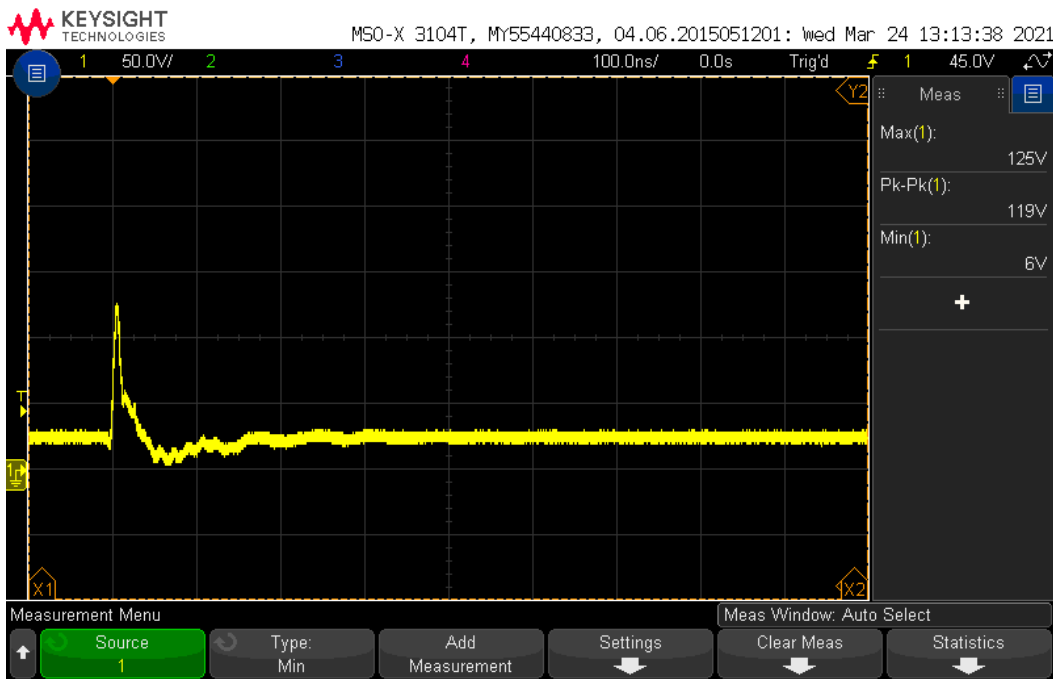


Figure 2.4-23 – Pulse 3b – Tr & Td – EUT

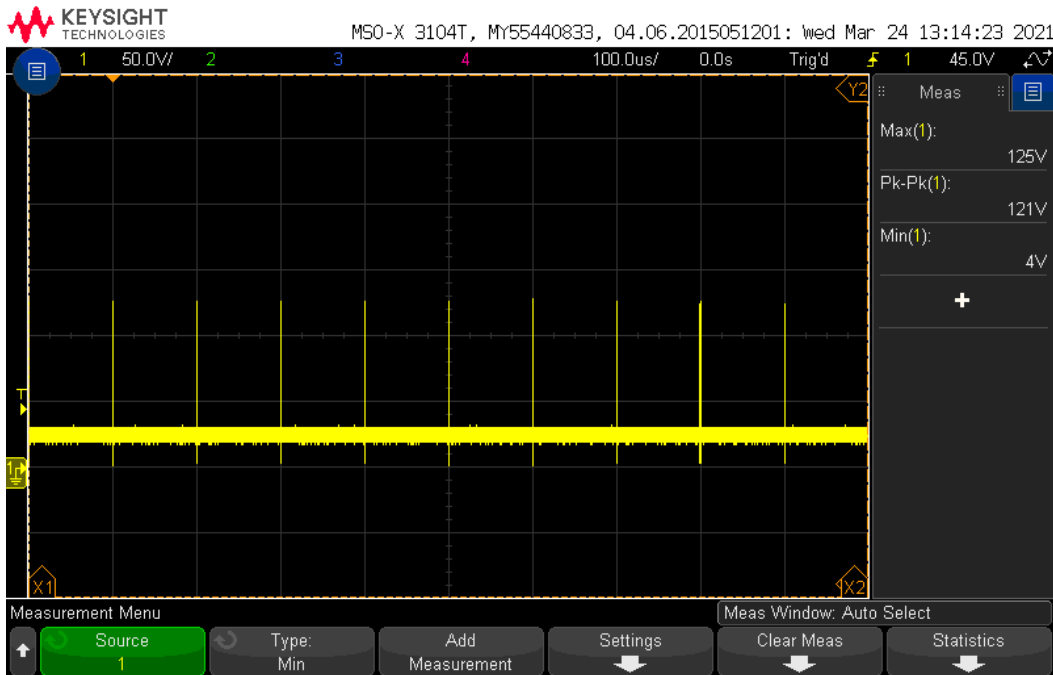


Figure 2.4-24 – Pulse 3b – T1 – EUT

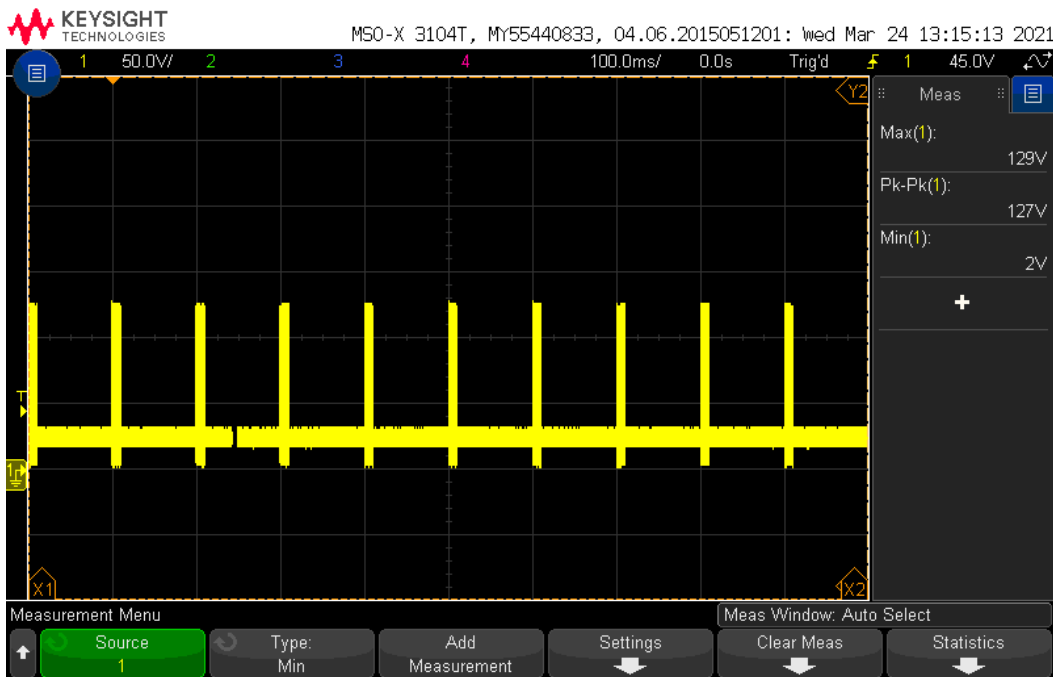


Figure 2.4-25 – Pulse 3b – T4 & T5 – EUT



2.4.7.6 Test Pulse 4

Table 2.4-13 – Test Pulse 4 Parameters

TEST VOLTAGE (VOLTS)	TEST LEVEL (U _s)	TRANSIENT Time (mSec)	TEST LEVEL (U _A)	TRANSIENT TIME (Sec)	SOURCE IMPEDANCE (OHMS)	REPETITIONS
12	-6	15	-2.5	2	0	3

TEST VOLTAGE (VOLTS)	TEST LEVEL (U _s)	TRANSIENT Time (mSec)	TEST LEVEL (U _A)	TRANSIENT TIME (Sec)	SOURCE IMPEDANCE (OHMS)	REPETITIONS
24	-12	50	-5	2	0	3

Table 2.4-14 – Observations During Testing

EUT Power / Configuration	Result	Observation
12 VDC	Pass	The EUT showed no signs of susceptibility during testing.
24 VDC	Pass	The EUT showed no signs of susceptibility during testing.

Test Summary: The EUT showed no signs of susceptibility during testing.

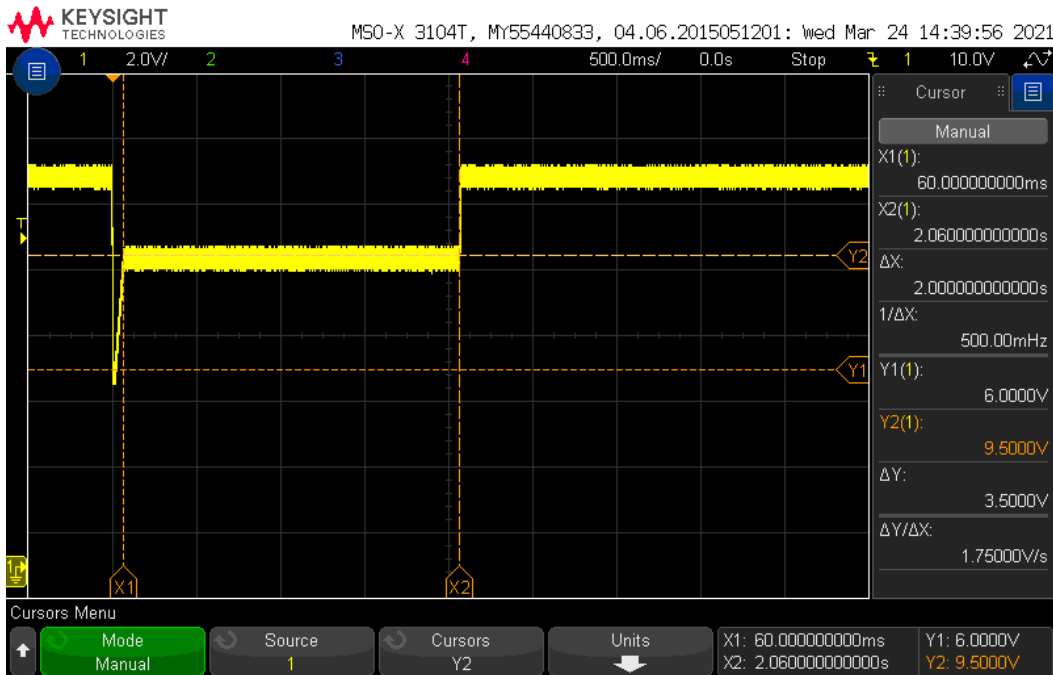


Figure 2.4-26 – Pulse 4 – Open Circuit – 12 VDC

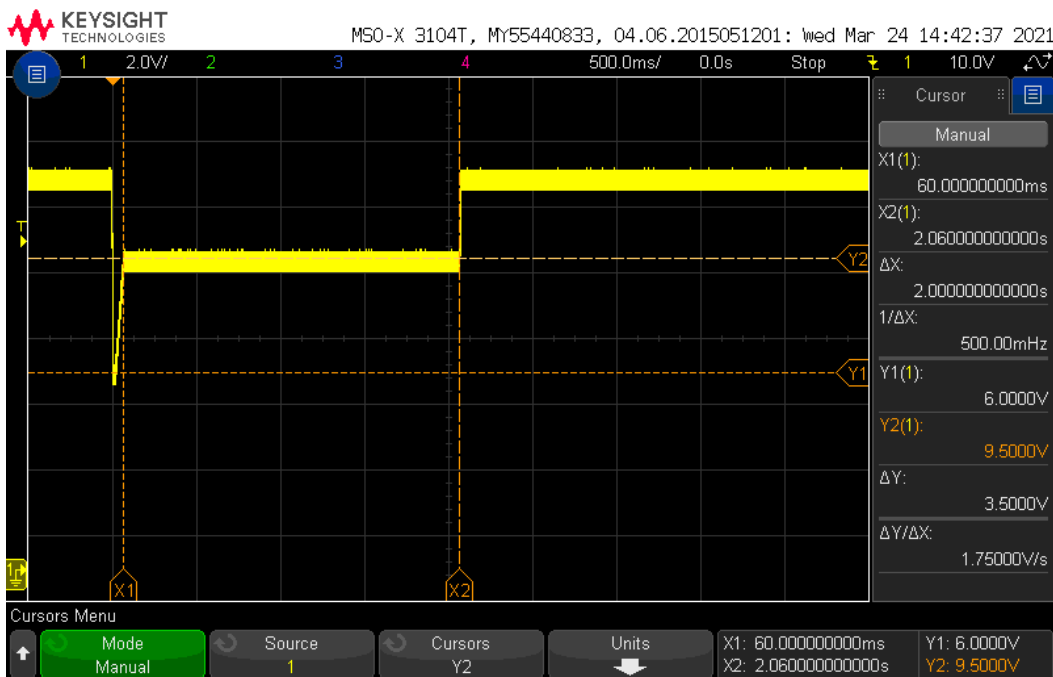


Figure 2.4-27 – Pulse 4 – EUT Load – 12 VDC

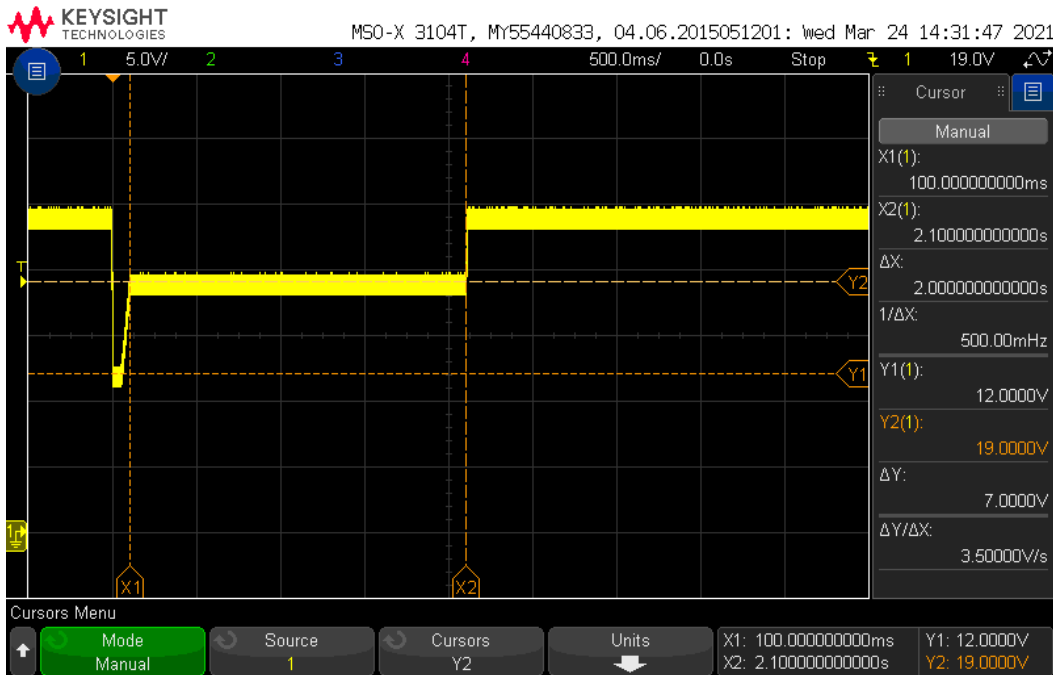


Figure 2.4-28 – Pulse 4 – Open Circuit – 24 VDC

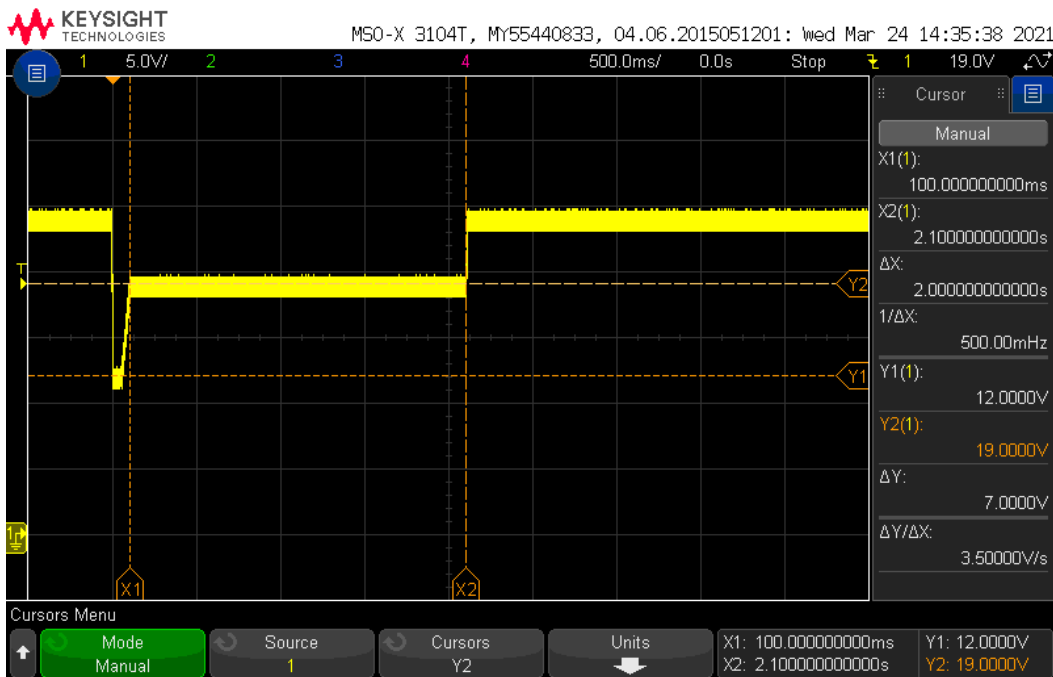


Figure 2.4-29 – Pulse 4 – EUT Load – 24 VDC

2.4.8 Test Set-up Photo



Photo 2.4-1 – Immunity to Conducted Transients on Power Leads – Pulses 1, 2a, 3a, and 3b



Photo 2.4-2 – Immunity to Conducted Transients on Power Leads – Pulses 2b and 4



2.4.9 Test Location and Test Equipment Used

This test was carried out in New Brighton, MN.
 Test Area: TRN1

Table 2.4-15 – Equipment List – Conducted Transient Immunity

Device #	Manufacturer	Description	Model	Serial #	Cal Code	Cal Date	Cal Due
NBLE11364	Tektronix	Scope Probe, 100:1	P5100A	C005801	G	05/20/2020	05/20/2021
NBLE11408	EM Test	Battery Vltg Variation Arb Gen	AutoWave	P1551169051	B	05/18/2020	05/18/2021
NBLE11409	EM Test	Voltage Drop Simulator, TP 2b/4	VDS 200Q100	P1607181941	B	05/18/2020	05/18/2021
NBLE11410	EM Test	Transient Rack AutoWave/VDS200Q (Tall)	None	None	Y	N/A	N/A
NBLE11411	EM Test	Ultra-Compact Simulator	UCS 200N100	P1548168213	B	05/18/2020	05/18/2021
NBLE11413	EM Test	Transient Rack UCS200N & LD 200N (short rack)	None	None	Y	N/A	N/A
NBLE11428	Keysight Technologies	Oscilloscope, 4-CH	MSO-X 3104T	MY55440833	G	05/18/2020	05/18/2021

Cal Code G = Calibration performed by an accredited outside source.
 Cal Code B = Calibration verification performed internally.
 Cal Code Y = Passive Device, or Calibration not required when used with other calibrated equipment.



3 Accreditation, Disclaimers and Copyright

TÜV SÜD America Inc.'s reports apply only to the specific sample tested under stated test conditions. It is the manufacturer's responsibility to assure the continued compliance of production units of this model. TÜV SÜD America, Inc. shall have no liability for any deductions, inferences or generalizations drawn by the client or others from TÜV SÜD America, Inc.'s issued reports.

This report is the confidential property of the client. As a mutual protection to our clients, the public and TÜV SÜD America, Inc., extracts from the test report shall not be reproduced, except in full without TÜV SÜD America, Inc.'s written approval.

This report must not be used to claim product certification, approval, or endorsement by A2LA, NIST, or any agency of the federal government.

STATEMENT OF MEASUREMENT UNCERTAINTY – Immunity

The data and results referenced in this document are accurate. The reader is cautioned that there is some measurement variability due to the tolerances of the test equipment that can contribute to a nominal product measurement uncertainty. Furthermore, component differences and manufacturing process variability of production units similar to that tested may result in additional product uncertainty. If necessary, refer to the test lab for the actual measurement uncertainty for specific tests.

STATEMENT OF MEASUREMENT UNCERTAINTY – Emissions

The test system for conducted emissions is defined as the LISN, tuned receiver or spectrum analyzer, and coaxial cable. This test system has a measurement uncertainty of ± 3.30 dB. The test system for radiated emissions is defined as the antenna, the pre-amplifier, the spectrum analyzer and the coaxial cable. This test system for 30 MHz-1000 MHz has a measurement uncertainty of ± 5.88 dB and above 1 GHz a measurement uncertainty of ± 4.47 dB. The measurement uncertainty values for conducted and radiated emissions meet the requirements as expressed in CISPR 16-4-2. The equipment comprising the test systems is calibrated on an annual basis.

TEST EQUIPMENT

All measurement instrumentation is traceable to the National Institute of Standards and Technology and is calibrated to meet test method standard requirements and/or manufacturer's specifications.



4 Customer Test Plan / Product Information

EQUIPMENT DESCRIPTION	
Model Name/Number	34044-1-000, 34044-1-100, 34044-1-200
Serial / Part Number	21090079M, 21100103D, 21100104F
Hardware Version	PCB Rev 201G
Software Version	0218, 0218, 0110
Technical Description (Please provide a brief description of the intended use of the equipment)	The unit is a combo input and output unit with digital and PWM outputs, and digital and analog inputs designed for the utility truck market.

Power Source	
Voltage (VDC)	Current Rating (A)
24	37

Mode of Operation
On/Off, Data, Percent, Amp, Digital Positive Input, Digital GND Input, 4-20mA Analog Input, 0-5, 0-10, 0-32 VDC Analog Input, Frequency Input, Counter Input.



Stimulated Functions
Analog / Digital input, PWM / Digital Output

Monitored Functions
VBAT, Analog / Digital input readings, PWM / Digital Output current feedback

Pass/Fail Criteria
Outputs should turn On and Off, Input readings should not differ by more than 5%.

Intended Emissions
None (unless contains wireless capabilities)

Is Immunity Related Function?	
(a) Functions related to direct control of the vehicle. (b) Functions related to driver, passenger and other road user protection. (c) Functions which, when disturbed, cause confusion to the driver or other road users. (d) Functions related to vehicle data bus functionality. (e) Functions which when disturbed affect vehicle statutory data (tachograph, odometer). (f) Function related to charging mode when coupled to the power grid. See Section 2.12 of UN ECE R10.08 for examples.	
Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>

I hereby declare that the information supplied is correct and complete.

Name: Shi Xiang Lim
 Position held: Electrical Engineer

Signature:
 Date: 03/25/2021