1250 Peterson Dr., Wheeling, IL 60090

Company: Holt Integrated Circuits, Inc.
Model Tested: HI-8429
Report Number: 20641
Project No. 6978

TEST SPECIFICATIONS:

RTCA/DO-160G (December 8, 2010)

RADIO TECHNICAL COMMISSION FOR AERONAUTICS

ENVIRONMENTAL CONDITIONS

AND

TEST PROCEDURE FOR AIRBORNE EQUIPMENT

THE FOLLOWING **MEETS** SECTION 25 PIN INJECTION TEST PROCEDURE(S) OF THE ABOVE TEST SPECIFICATION

Formal Name:	8-Channel GND/Open or Supply/Open Discrete Sensor with Integrated DO-160G Level 3 Lightning Protection
Kind of Equipment:	Discrete-to-Digital Sensing Integrated Circuit
Test Configuration:	Tabletop (Tested at 3.3 Vdc & 16.5 Vdc)
Model Number(s):	HI-8429
Model(s) Tested:	HI-8429
Serial Number(s):	1, 2, and 3
Date of Tests:	December 22, 2014
Test Conducted for:	Holt Integrated Circuits, Inc. 23351 Madero Mission Viejo, California 92691

NOTICE: “This report must not be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government”. Please see the "Additional Description of Equipment Under Test" page listed inside of this report.

SIGNATURE PAGE

Report Written By:

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Report Reviewed By:

Jack Prawica
Lab Manager
EMC-002412-NE

Report Approved By:

Brian J. Mattson
General Manager

TABLE OF CONTENTS

United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 100276-0

D.L.S. Electronic Systems, Inc.
Wheeling, IL

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2014-10-01 through 2015-09-30
Effective dates

For the National Institute of Standards and Technology

NVLAP-01C (REV. 2009-01-28)

1.0 INTRODUCTION:

On December 22, 2014, a series of susceptibility tests were made to demonstrate that the 8-Channel GND/Open or Supply/Open Discrete Sensor with Integrated DO-160G Level 3 Lightning Protection, Model(s) HI-8429, Serial No. 1, 2, and 3, manufactured by Holt Integrated Circuits, Inc. was tested to the requirements of RTCA/DO-160G (December 8, 2010), Environmental conditions and Test Procedures for Airborne Equipment using the following test procedure(s): Section 22 Pin Injection.

2.0 TEST FACILITY:

D.L.S. Electronic Systems, Inc. is a full service EMC Testing Laboratory accredited to ISO Guide 17025. NVLAP Certificate and Scope can be viewed at http://www.dlsemc.com/certificate. Our facilities are registered with the FCC, Industry Canada, and VCCI. All tests were performed by personnel of D.L.S. Electronic Systems, Inc. at the following location(s):

Main Test Facility:
D.L.S. Electronic Systems, Inc.
1250 Peterson Drive
Wheeling, Illinois 60090

A list of the test equipment used, along with identification and calibration data, is included in the Table of each Appendix of this report. All primary equipment was calibrated against known reference standards with a verified traceable path to NIST.

3.0 TEST SET-UP:

All susceptibility tests were performed at D.L.S. Electronic Systems, Inc. The 8-Channel GND/Open or Supply/Open Discrete Sensor with Integrated DO-160G Level 3 Lightning Protection was placed on a copper bench measuring 24' long and 40" wide. The following describes the lab that was used for testing:

LAB T* 36' long x 25' wide x 20' high anechoic/ferrite tile lined enclosure.

*****Electromagnetic field absorbers were strategically placed according to Figure 21-11 of the RTCA/DO-160 Standard. All lines leaving the room were filtered. The auxiliary equipment was located outside the main room.

The tests were run in the following lab:

LAB T: Section 22, Lightning Induced Transient Susceptibility Pin Injection

4.0 OPERATING CONDITIONS OF TEST SAMPLE:

All test measurements were made at a laboratory temperature of **72˚F** at **35%** humidity with the following mode of operation:

Power up the device 3.3V supply at VLogic and 16.5V at VDD.

5.0 PERFORMANCE MONITORED:

The 8-Channel GND/Open or Supply/Open Discrete Sensor with Integrated DO-160G Level 3 Lightning Protection performance was monitored as follows:

Any change to the initial supply current measurement after lightning injection will be characterized as out of specification.

6.0 DESCRIPTION OF TEST SAMPLE: (See also Paragraph 7.0)

6.1 DESCRIPTION:

8-Channel GND/Open or Supply/Open Discrete Sensor with Integrated DO-160G Level 3 Lightning Protection.

6.2 DESCRIPTION OF ALL CIRCUIT BOARDS:

Board 1 Ground/Open: Discrete-to-Digital IC on a PCB	SN1 & SN2: HI-8429PSTF Lot#7128B Date Code 1441
Board 2 Supply/Open: Discrete-to-Digital IC on a PCB	SN3: HI-8429PSTF Lot#7128B Date Code 1441

7.0 ADDITIONAL DESCRIPTION OF EQUIPMENT UNDER TEST:

There were no changes made during testing.

8.0 PHOTO ID INFORMATION:

The test set up can be seen in the accompanying photograph.

Item 0 8-Channel GND/Open or Supply/Open Discrete Sensor with Integrated DO-160G Level 3 Lightning Protection
Model Number: HI-8429
Serial Number: 1, 2, and 3

Item 1 Chip SN#1 and SN#2

Item 2 Chip SN#3

9.0 PHOTO ID TAKEN DURING TESTING:

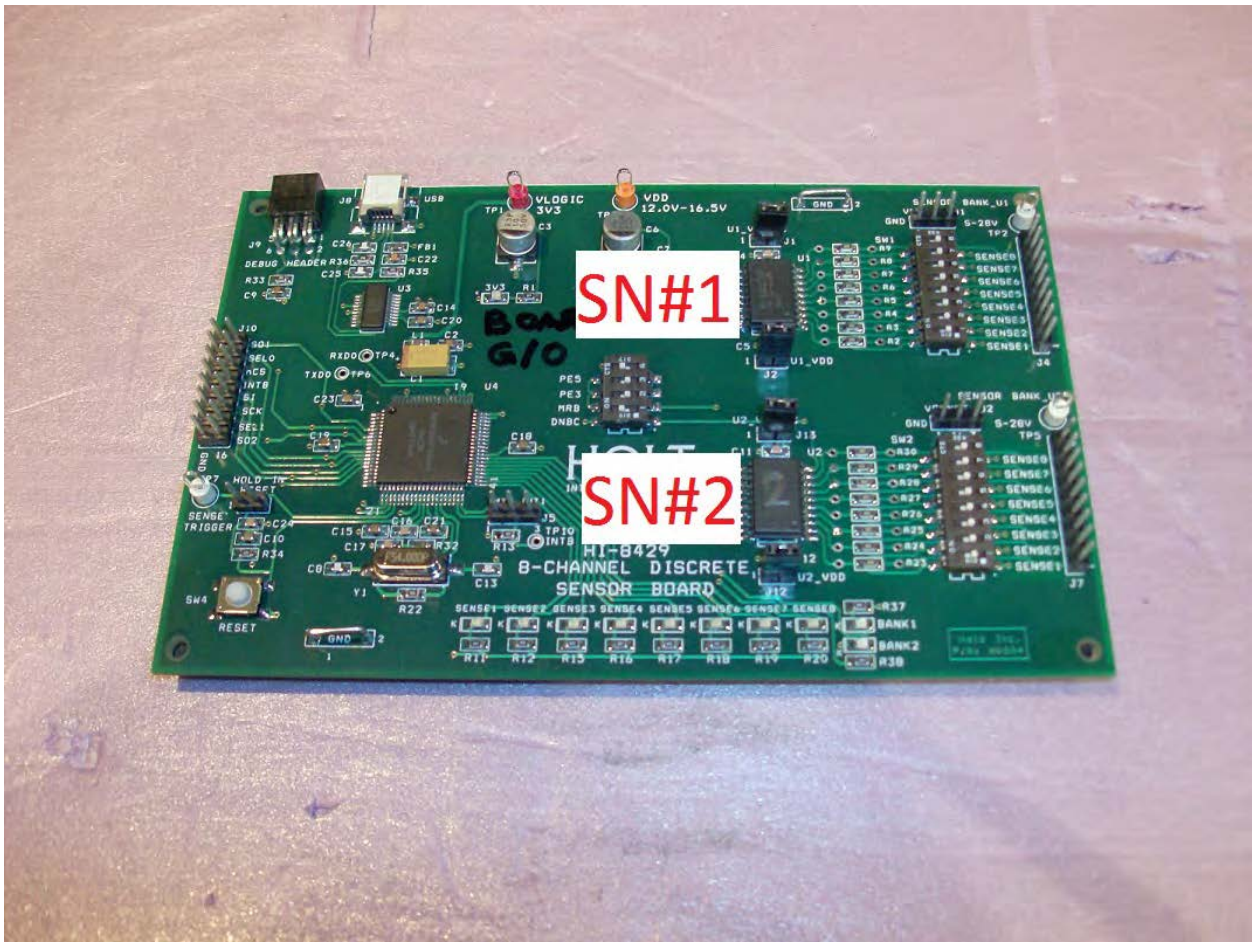


Photo ID 1

9.0 PHOTO ID TAKEN DURING TESTING:

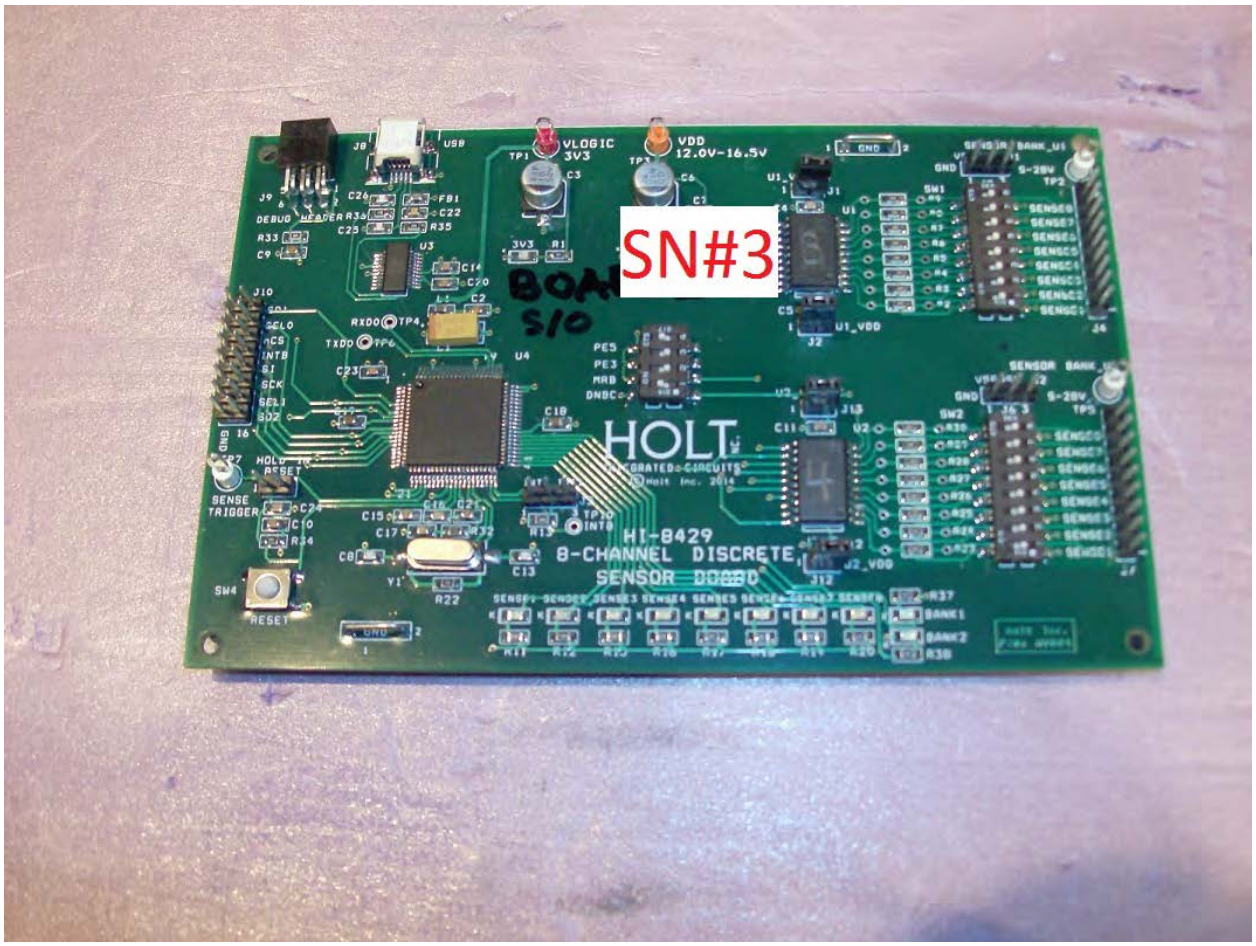


Photo ID 2

11.0 REFERENCES:

RTCA/DO-160G "Environmental Conditions and Test Procedures for Airborne Equipment" (Radio Technical Commission for Aeronautics, December 8, 2010)

NOTE: All listed paragraphs, figures and tables are reference to the above standard unless otherwise specified.

12.0 TEST RESULTS:

The 8-Channel GND/Open or Supply/Open Discrete Sensor with Integrated DO-160G Level 3 Lightning Protection was subject to the test procedure(s) Section 22 Pin Injection. A detailed explanation of how these tests and their measurements were made is shown in Appendix(es) A at the end of this report.

13.0 CONCLUSION OF SUSCEPTIBILITY TESTS:

The 8-Channel GND/Open or Supply/Open Discrete Sensor with Integrated DO-160G Level 3 Lightning Protection, Model(s) HI-8429, **meets** Section 25 Pin Injection Test Procedure(s) RTCA/DO-160G (December 8, 2010), Environmental conditions and Test Procedures for Airborne Equipment. See the Appendix(es) A for a detailed explanation of the test results.

APPENDIX A

RTCA/DO-160G

SECTION 22

PARAGRAPH 22.5

LIGHTNING INDUCED

TRANSIENT SUSCEPTIBILITY

PIN INJECTION

1.0 PURPOSE OF THE TEST:

These tests verify the capability of the equipment to withstand effects of lightning induced electrical transients. The damage tolerance test was performed using the Pin Injection test method.

2.0 CATEGORIES, WAVEFORMS AND LEVELS:

Category designations for equipment consist of five characters appears as follows:

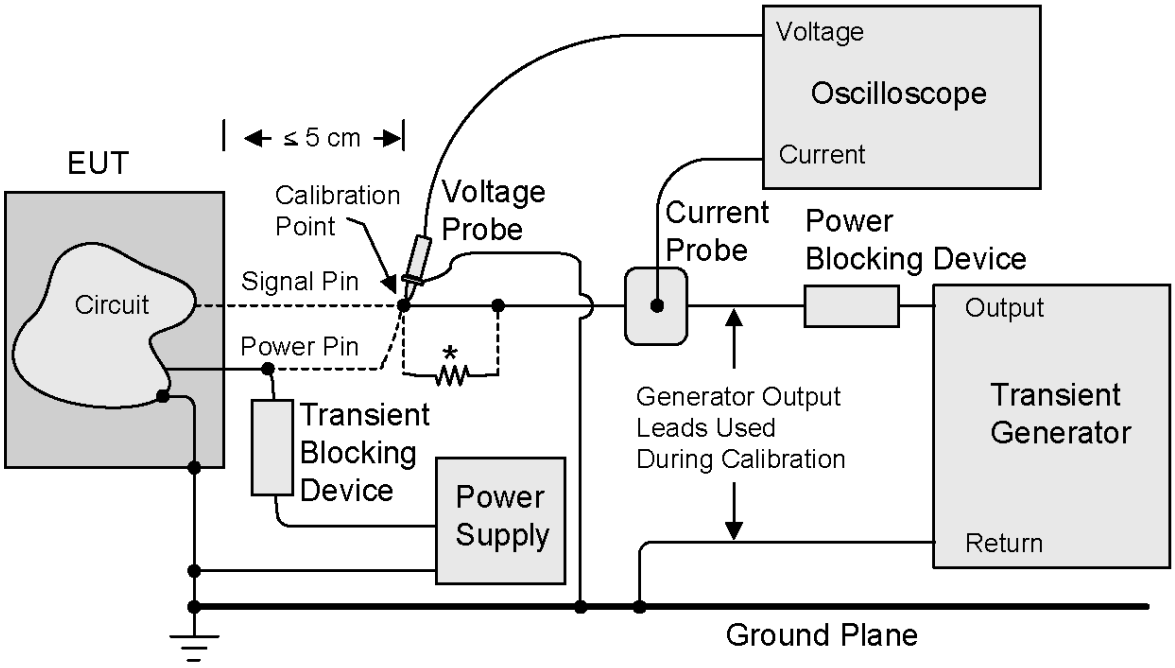
3, 4, 5A, & 5B	3	X	X	X	X
Pin Test Waveform Set	Pin Test Level	Cable Bundle Single and Multiple Stroke Test Waveform Set	Cable Bundle Single and Multiple Stroke Test Level	Cable Bundle Multiple Burst Test Waveform Set	Cable Bundle Multiple Burst Test Level

X = Tests not performed

The equipment under test was tested to the levels and waveforms consistent with its expected use and aircraft installation. The 8-Channel GND/Open or Supply/Open Discrete Sensor with Integrated DO-160G Level 3 Lightning Protection was subjected to Waveform(s) 3, 4, 5A & 5B using Level(s) 3 and Categories A3, B3 & Z3.

3.0 TEST SETUP AND APPARATUS:

A typical test setup is shown in Figure 22-13.



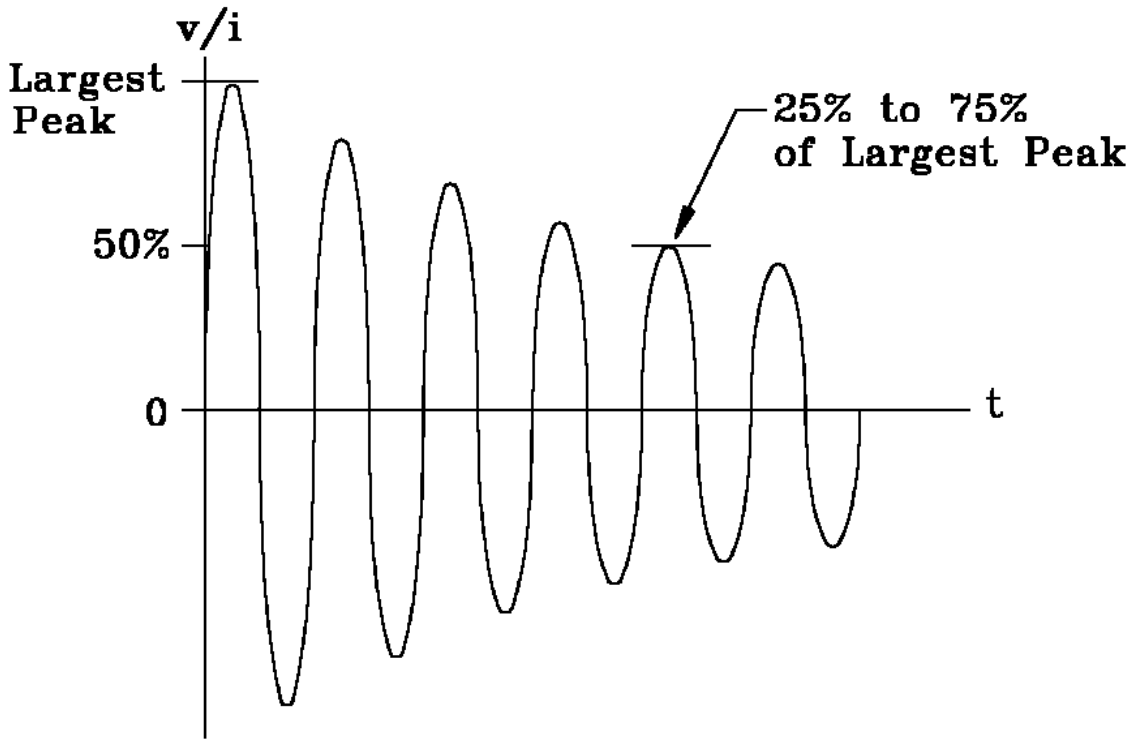
NOTES:

1. *The notes from the calibration setup of Figure 22-10 apply.*
2. *Test setup and procedures are to be such that the required lightning transients appear differentially between the aircraft power and return/neutral lines. If power and return/neutral originate from a remote load, in the same cable bundle with signals, then the test setup should use an isolated power return to ensure the proper common-mode evaluation.*
3. *The power supply is not necessary for tests on un-powered equipment.*
4. *Test procedures assume lightning transients appear common-mode between all pins and case. If the expected installation utilizes local power and/or signal returns tied either internally or externally to case or aircraft structure, tests shall be performed with the return(s) tied to the case.*
5. *Return wire lengths shall be kept as short as possible.*

Figure 22-13 Pin Injection Test Setup, Signal Pins & Power Pins – Direct Injection Method

3.0 TEST SETUP AND APPARATUS: (CON'T)

The transient generator used produced the Voltage/Current Waveform 3 shown in Figure 22-3 of the test specification. Any method of generating the spike may be used if the waveform complies with Figure 22-3. The generator was connected to the designated pin and case ground of the device under test by means of a short, low inductance lead.



NOTES:
1. *Voltage and current are not required to be in phase.*
2. *The waveshape may have either a damped sine or cosine waveshape.*

Figure 22-3 Voltage/Current Waveform 3

3.0 TEST SETUP AND APPARATUS: (CON'T)

The transient generator used produced the Voltage Waveform 4 shown in Figure 22-4 of the test specification. Any method of generating the spike may be used if the waveform complies with Figure 22-4. The generator was connected to the designated pin and case ground of the device under test by means of a short, low inductance lead.

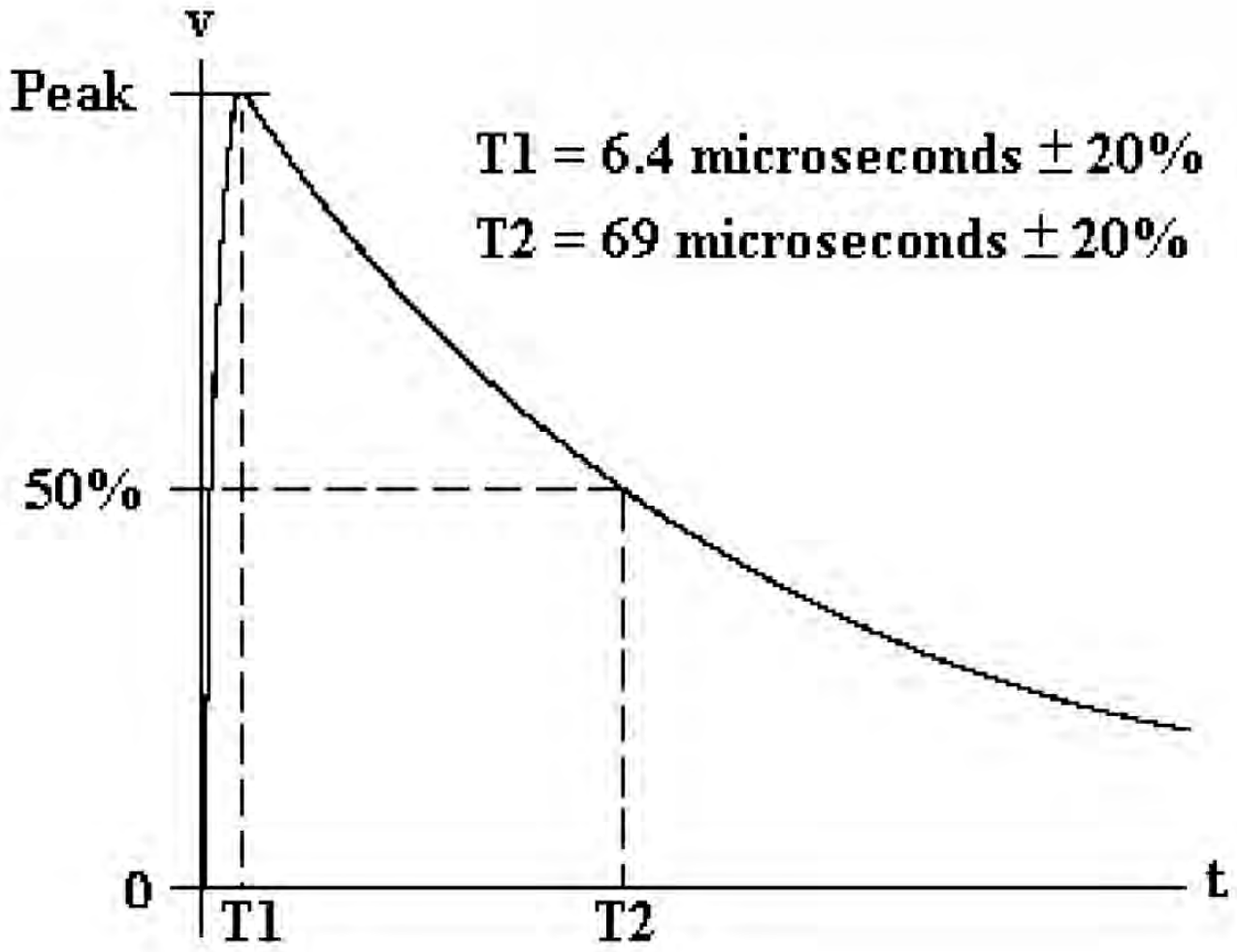


Figure 22-4 Voltage Waveform 4

3.0 TEST SETUP AND APPARATUS: (CON'T)

The transient generator used produced the Current/Voltage Waveform 5 shown in Figure 22-5 of the test specification. Any method of generating the spike may be used if the waveform complies with Figure 22-5. The generator was connected to the designated pin and case ground of the device under test by means of a short, low inductance lead.

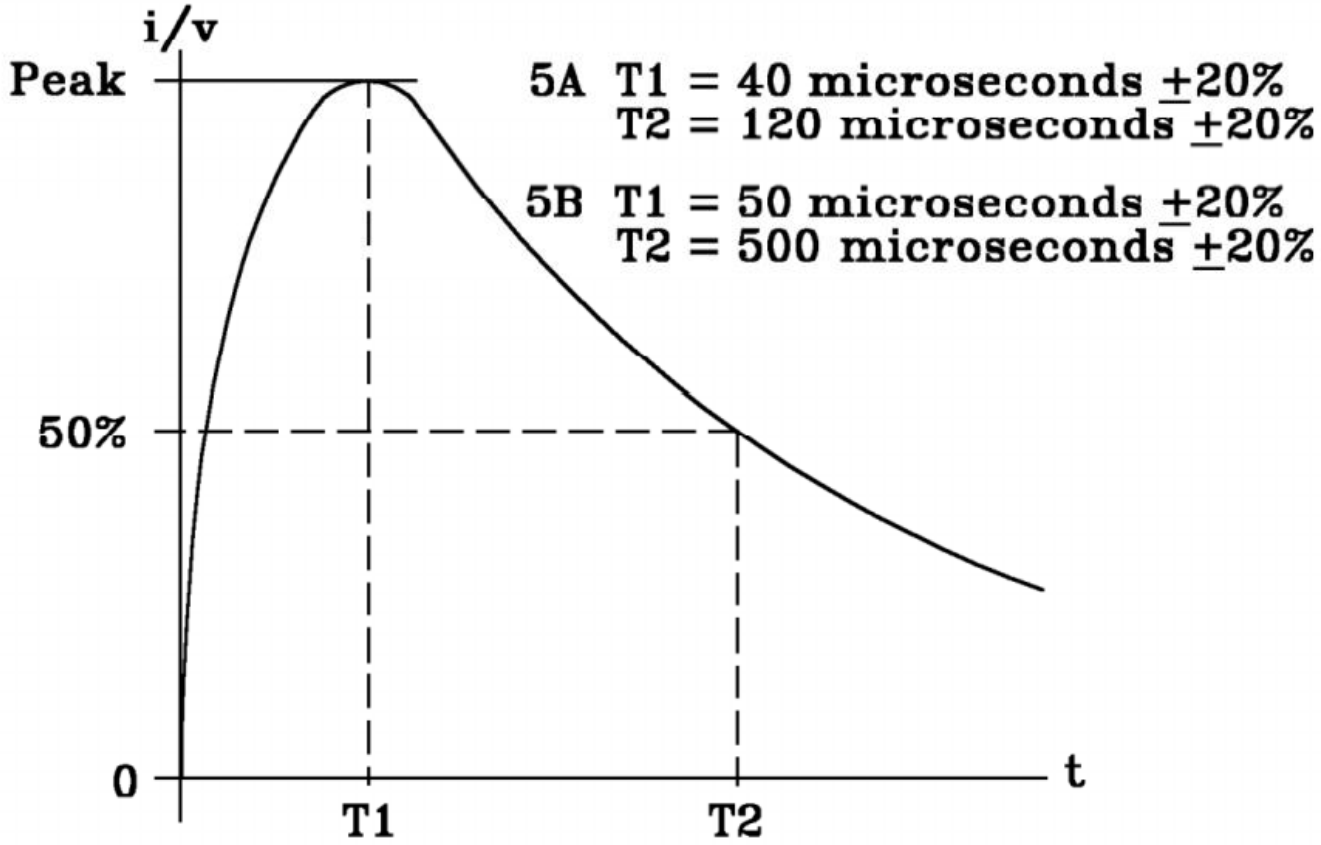


Figure 22-5 Current/Voltage Waveform 5

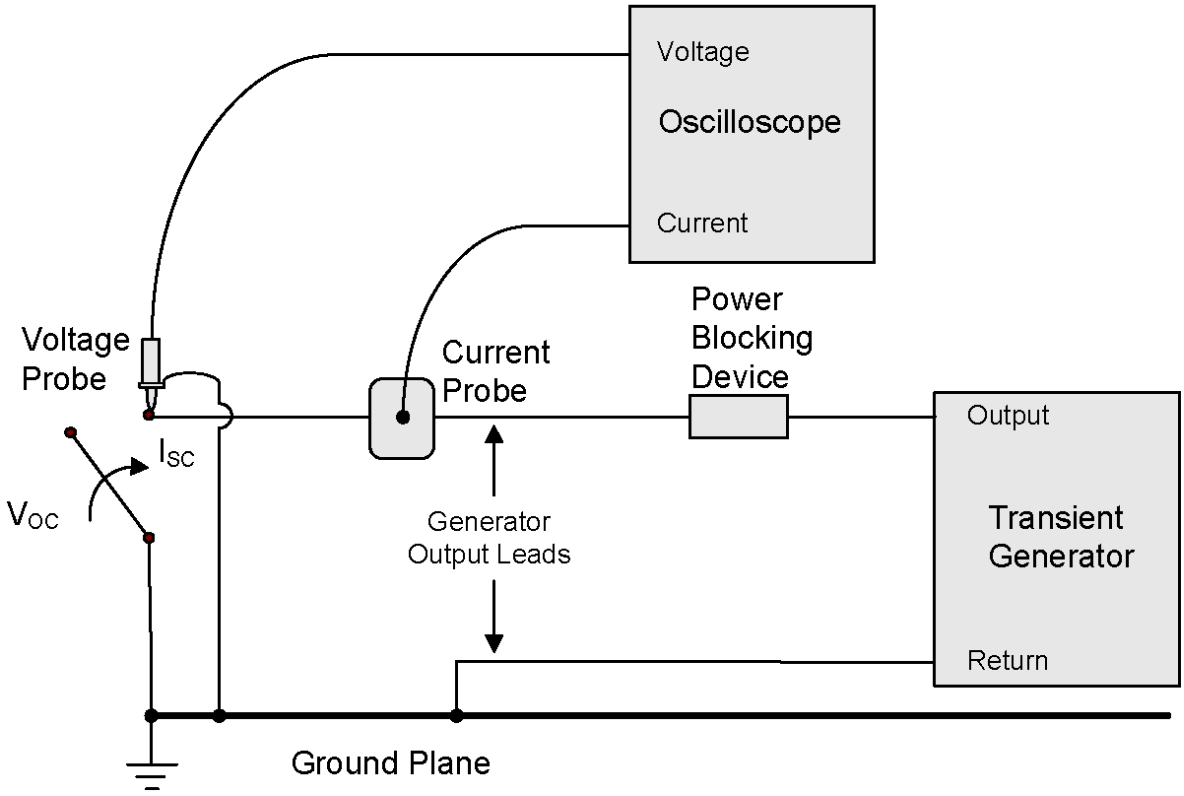
4.0 TEST PROCEDURE:

Pin injection testing is a technique whereby the chosen transient waveform(s) is applied directly to each pin and case ground of the designated pins. Waveform 3 (1MHz damped sine) and Waveform 4 (6.4 x 69us double exponential), Waveform 5A (40 x 120us double exponential) and Waveform 5B (50 x 500us double exponential) were each applied at levels 3, positive and negative polarities, to the 8-Channel GND/Open or Supply/Open Discrete Sensor with Integrated DO-160G Level 3 Lightning Protection pins called out in Table 22-1 & 22-2 of RTCA/DO-160G. The 8-Channel GND/Open or Supply/Open Discrete Sensor with Integrated DO-160G Level 3 Lightning Protection was powered up and none of the cables were connected throughout Pin Injection test.

For each waveform at each level, ten positive and ten negative discharges were applied at minimum intervals of 10 seconds. The actual waveshape applied to each pin was measured with a 1000x oscilloscope probe within 5cm of the pin. All waveshapes were recorded.

4.0 TEST PROCEDURE:

The following test setup was used for calibration.



NOTES:

1. *Tests of active ac power circuits may require transformer coupling of the applied transients to the power lines and transients should be synchronized to the pea k of the ac waveform.*

2. *A power blocking device may be used to isolate voltages at the pins of the EUT from the low generator impedance and must be present during calibration since they may adversely affect the waveform calibration. Typical power blocking devices are bipolar suppression devices for Waveforms 4 and 5 or a series capacitor for Waveform 3. The bipolar suppression device is selected with a voltage rating close to the expected EUT operating voltage but may have a nominal value to allow testing with one calibrated setup. A voltage rating that represents a significant percentage of the applied transient will affect waveform calibration. The capacitor is selected to achieve the calibration current; too large a value may produce unwanted resonance during test.*

3. *The Power Blocking Device is not necessary for tests on un -powered equipment.*

Figure 22-10 Pin Injection Calibration Setup, Signal Pins & Power Pins – Direct Injection Method

5.0 LIMITS & RESULTS:

5.1 LIMITS:

The Waveform used for the test is taken from the following table:

Table 22-2 Generator Setting Levels for Pin Injection

Level	Waveforms		
	3/3	4/1	5A/5A
	Voc/Isc	Voc/Isc	Voc/Isc
1	100/4	50/10	50/50
2	250/10	125/25	125/125
3	600/24	300/60	300/300
4	1500/60	750/150	750/750
5	3200/128	1600/320	1600/1600

NOTES:

1. *Voc = Peak Open Circuit Voltage (Volts) available at the calibration point shown in Figure 22-10, Figure 22-11, or Figure 22-12.*
2. *Isc = Peak Short Circuit Current (Amps) available at the calibration poin t shown in Figure 22-10, Figure 22-11, or Figure 22-12.*
3. *Amplitude Tolerances +10%, -0%.*
4. *The ratio of Voc to Isc is the generator source impedance to be used during the calibration procedure.*
5. *Waveforms 3, 4 and 5A are identified in Figure 22-3, Figure 22-4 and Figure 22-5.*

a

5.0 LIMITS & RESULTS (CON'T):

5.2 RESULTS:

The unit under test was powered up and monitored for susceptibility during testing. The actual waveshapes were applied to the pins and recorded. For both waveforms, the waveshape greatly varied from pin to pin due to the different impedances seen by the generator, from the pins and any resistors or capacitors. On any given pin, the waveshape did not significantly vary between the first and tenth discharges. At regular intervals and after all events, the generators' open circuit calibration waveshape and source impedance were re-verified. In all cases, the generator maintained its' performance. There were no events noted during testing, indicating possible damage to circuitry through these pins. The post operation was verified and the 8-Channel GND/Open or Supply/Open Discrete Sensor with Integrated DO-160G Level 3 Lightning Protection passed the requirements of Section 22 (Pin Injection).

The 8-Channel GND/Open or Supply/Open Discrete Sensor with Integrated DO-160G Level 3 Lightning Protection **meets** the following conditions:

Lab used: T

Summary:

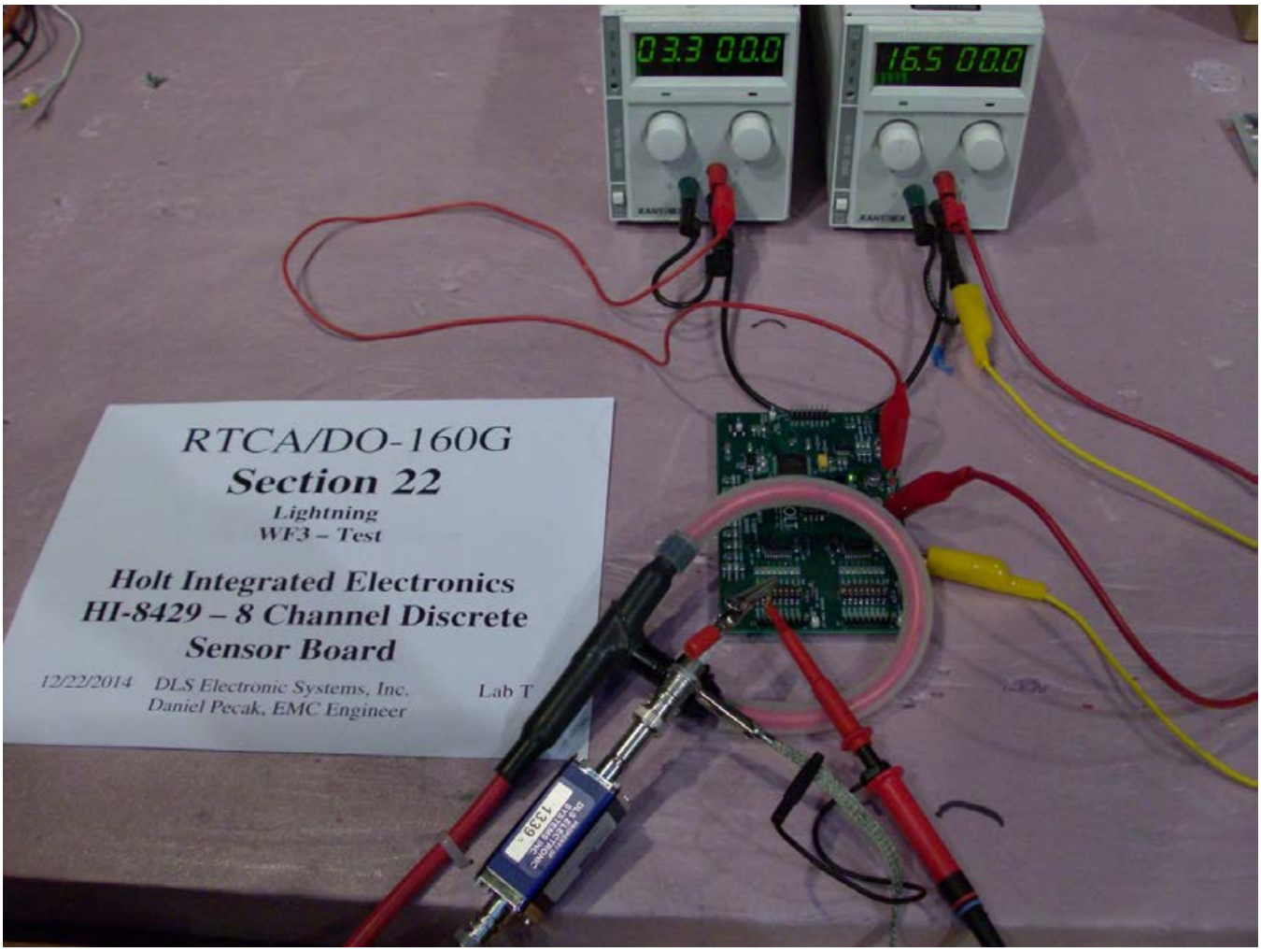
No damage occurred during Section 22 Pin injection testing.
Chip SN#1 : Tested to category A3
Chip SN#2 : Tested to category Z3
Chip SN#3 : Tested to category B3
See the data sheets at the end of this appendix for the test results.

5.3 Pre and Post test current measurements:

Board #1	Pre-Test Current	Post-Test Current
16.5 VDC	29mA	29mA
3.3 VDC	65mA	65mA

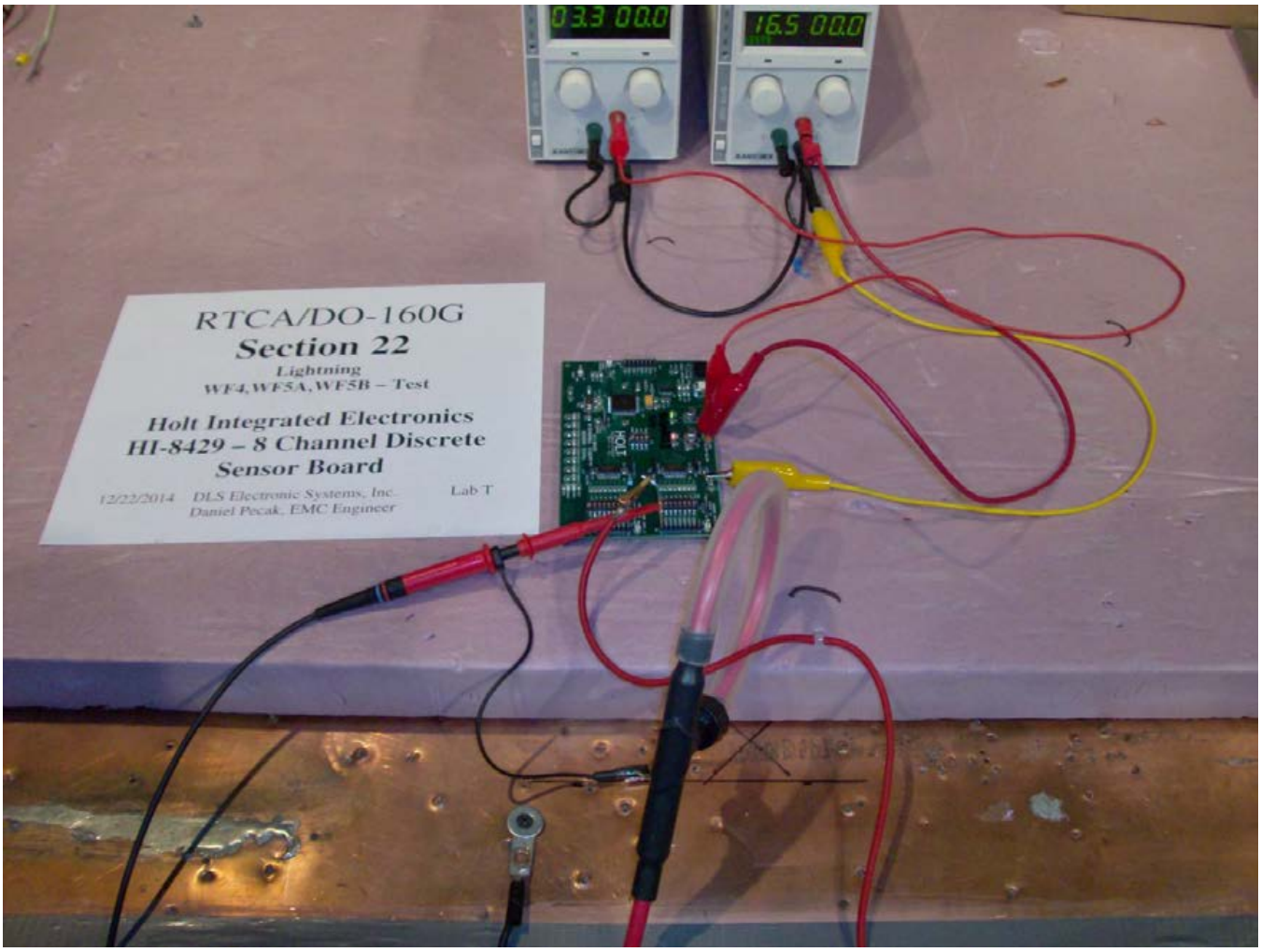
Board #2	Pre-Test Current	Post-Test Current
16.5 VDC	35mA	35mA
3.3 VDC	66mA	66mA

6.0 PHOTOS TAKEN DURING TESTING



Section 22 - WF3 - Test

6.0 PHOTOS TAKEN DURING TESTING

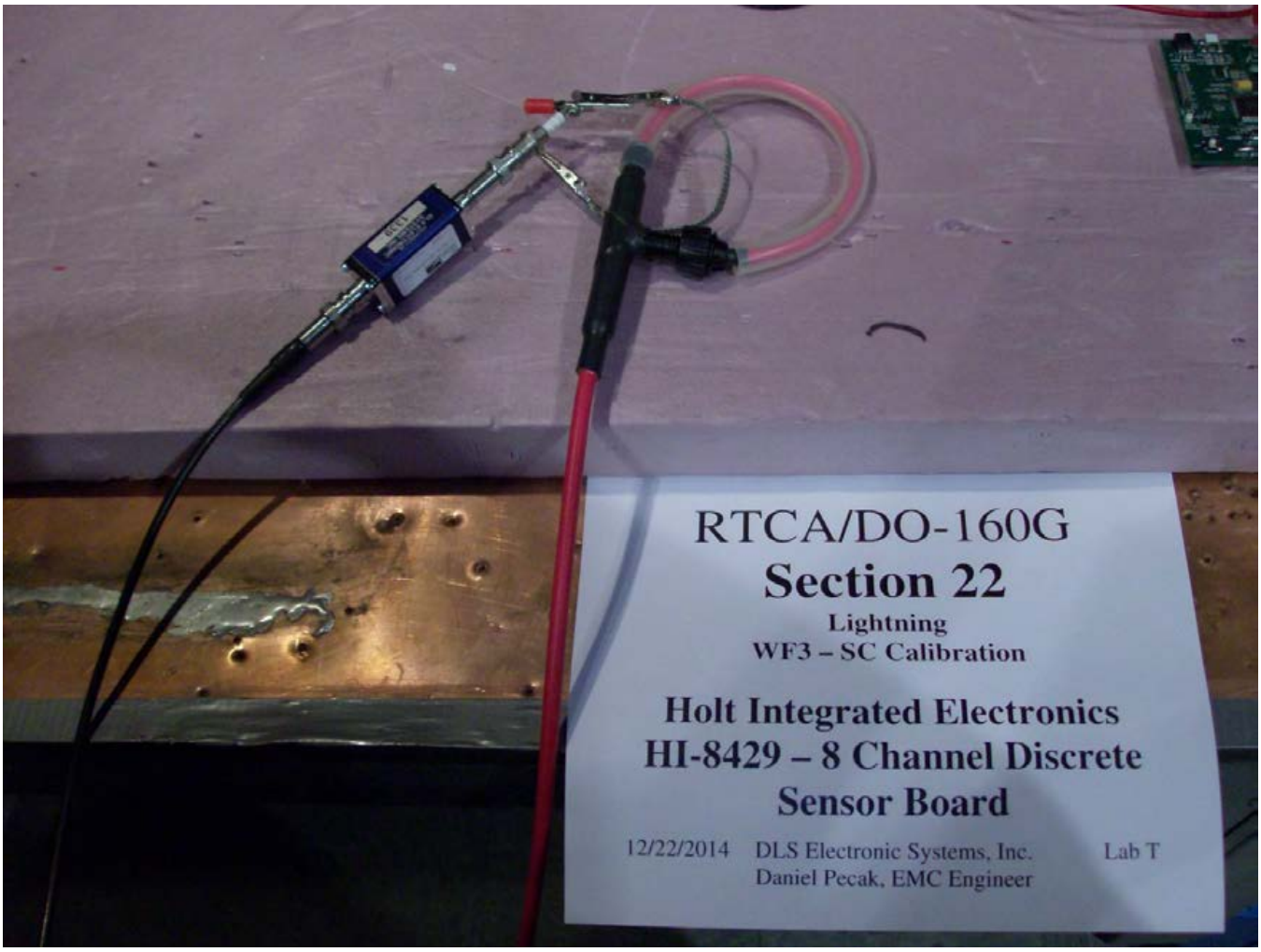


Section 22 - WF4, WF5a, WF5b - Test

6.0 PHOTOS TAKEN DURING TESTING

Section 22 - WF3 - OC Calibration

6.0 PHOTOS TAKEN DURING TESTING



Section 22 - WF3 - SC Calibration

6.0 PHOTOS TAKEN DURING TESTING

Section 22 - WF4, WF5a, WF5b - OC Calibration

6.0 PHOTOS TAKEN DURING TESTING

Section 22 - WF4, WF5a, WF5b - SC Calibration

TABLE 1 / TEST INSTRUMENTATION

Description	Manufacturer	Model Number	Serial Number	Range	Cal On	Cal Due Dates
Oscilloscope, Digital	LeCroy	WavePro 7200A	LCRY0705N13389	2 GHz	6/11/2014	6/11/2015
Probe, Current, Rogowski	PEM	CWT 3R	10134-11407	2 kHz	3/6/2014	3/6/2015

All primary equipment is calibrated against known reference standards with a verified traceable path to NIST.

TABLE 2 / TEST EQUIPMENT

Description	Manufacturer	Model Number	Serial Number	Range
Decoupler	EMC Partner	AC-DC DECOUPLER2-1524	103170	N/A
Generator, Impulse	EMC Partner	MIG-OS-MB	457	N/A
Generator, Transient	EMC Partner	MIG0600MS	462 & 463	N/A
Power supply, DC	Xantrex	N/A	73473	N/A
Power supply, DC	Xantrex	N/A	73474	N/A

Amplifiers and transmit antennas do not require calibration.

SECTION 22

PIN INJECTION

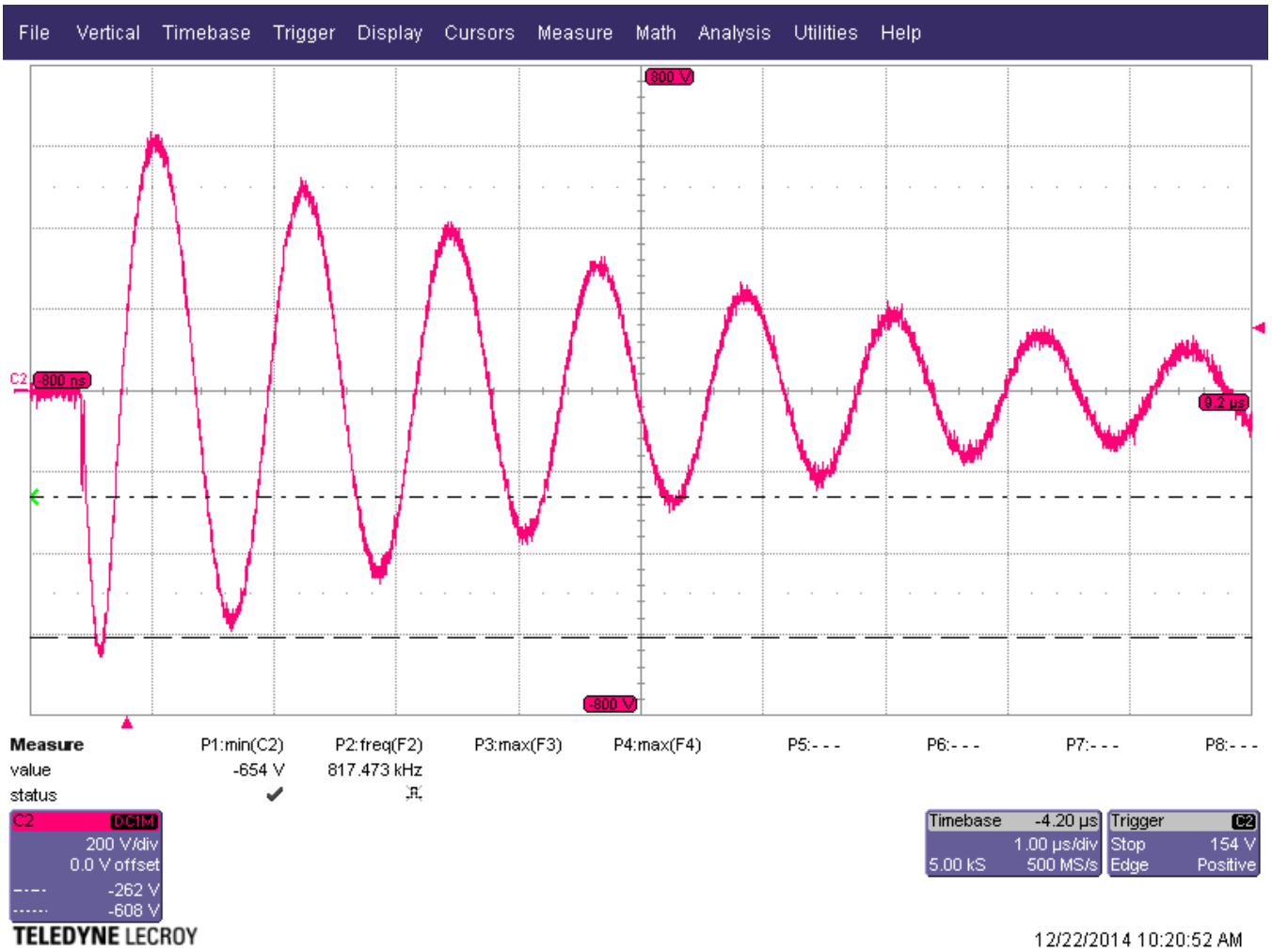
WF3 VERIFICATION DATA SHEETS

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 10:20:43 AM

Pin WF3 Level 3 Open Circuit Verification - Negative

EMC & Product Safety Testing • Consulting

WF3 Pin Injection
Open Circuit Verification
Level 3 600V/24A
f=1MHz +-20%
5th-25%-75% of 1st
Gen = 670



Channel Status

		C2
Vertical	V / Div	200 V
	Offset	0.0 V
	Coupling	DC1MΩ
	BW-Limit	Full
	Probe	1.000e+3
	Sweeps	1 #

Acquisition Status

Time / Div	1.00 µs	Sampling Rate	500 MS/s

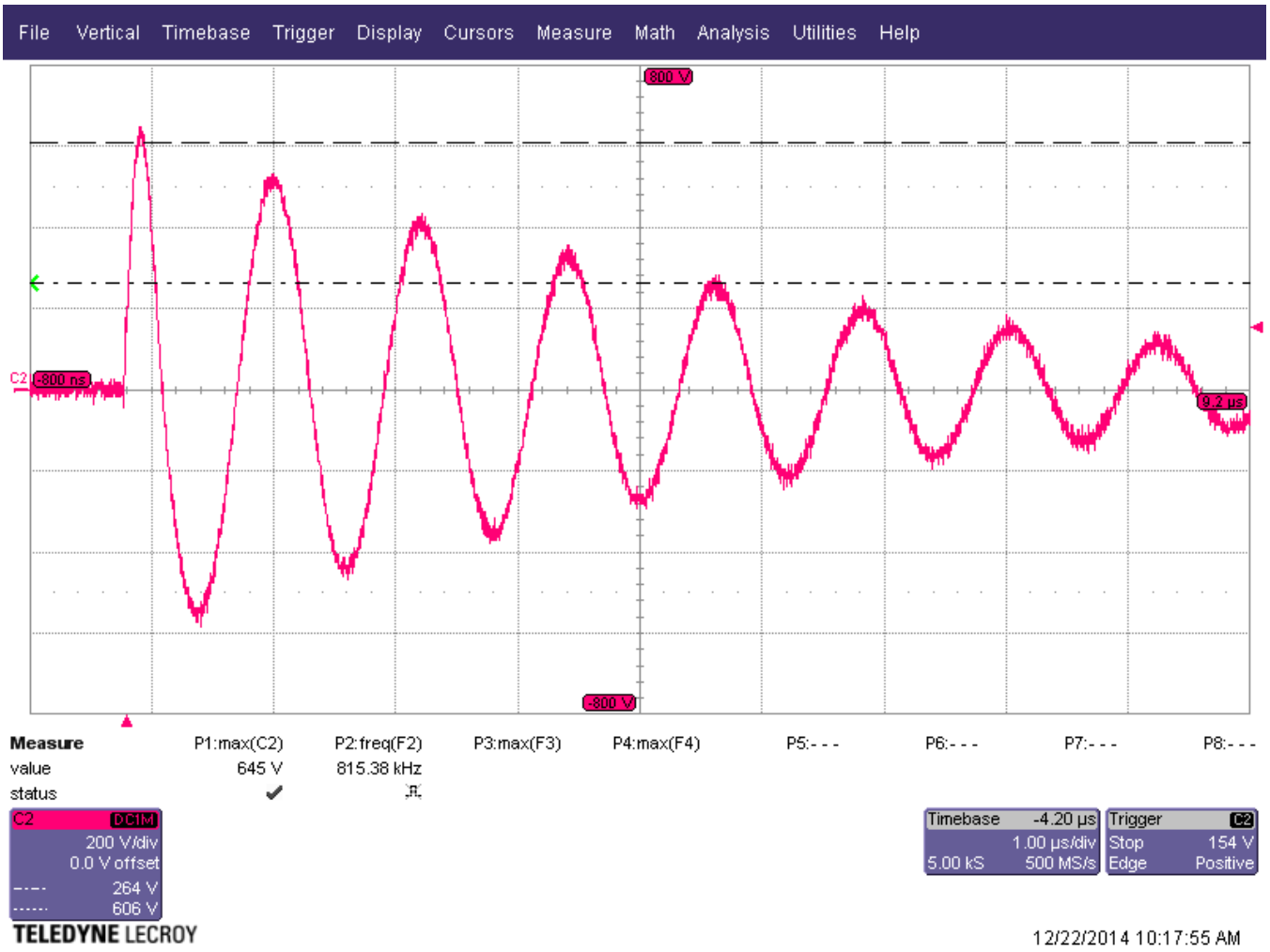
Horizontal	Time / Pt	2.000 ns	Sampling Mode	RealTime
	Pts / Div	500.0 S	Trigger Delay	-4.20 µs
Trigger	Mode	Stop	Slope	Positive
	Type	Edge	Level	154 V
	Source	C2	Coupling	DC

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 10:17:39 AM

Pin WF3 Level 3 Open Circuit Verification - Positive

EMC & Product Safety Testing • Consulting

WF3 Pin Injection
Open Circuit Verification
Level 3 600V/24A
f=1MHz +-20%
5th-25%-75% of 1st
Gen = 670



Channel Status

		C2
Vertical	V / Div	200 V
	Offset	0.0 V
	Coupling	DC1MΩ
	BW-Limit	Full
	Probe	1.000e+3
	Sweeps	1 #

Acquisition Status

Time / Div	1.00 µs	Sampling Rate	500 MS/s

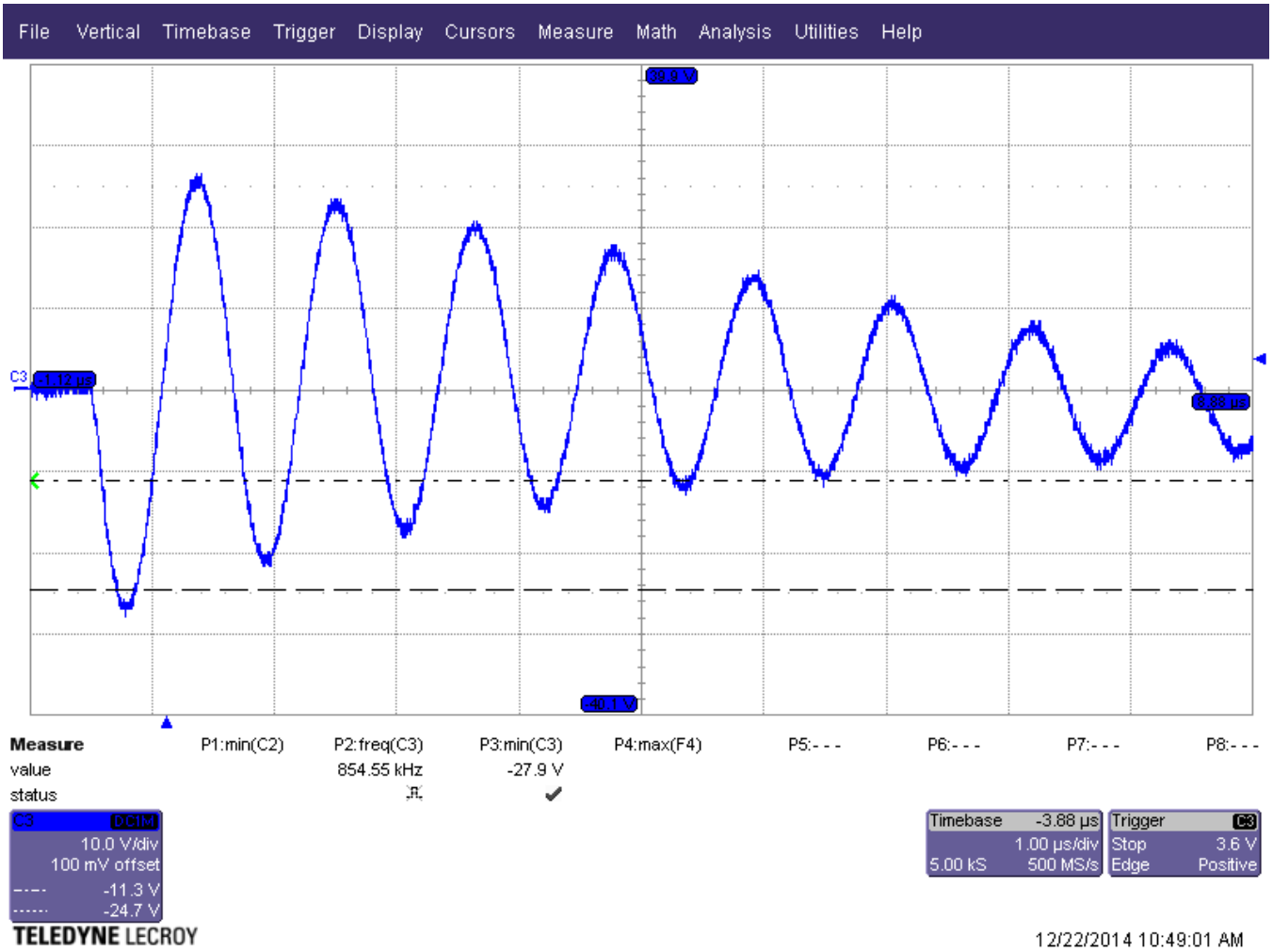
Horizontal	Time / Pt	2.000 ns	Sampling Mode	RealTime
	Pts / Div	500.0 S	Trigger Delay	-4.20 µs
Trigger	Mode	Stop	Slope	Positive
	Type	Edge	Level	154 V
	Source	C2	Coupling	DC

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 10:48:52 AM

Pin WF3 Level 3 Short Circuit Verification - Negative

DLS EMC & Product Safety Testing • Consulting

WF3 Pin Injection
Short Circuit Verification
Level 3 600V/24A
f=1MHz +-20%
5th-25%-75% of 1st
Gen = 670



Channel Status

		C3
Vertical	V / Div	10.0 V
	Offset	100 mV
	Coupling	DC1MΩ
	BW-Limit	Full
	Probe	100.000
	Sweeps	1 #

Acquisition Status

Time / Div	1.00 µs	Sampling Rate	500 MS/s

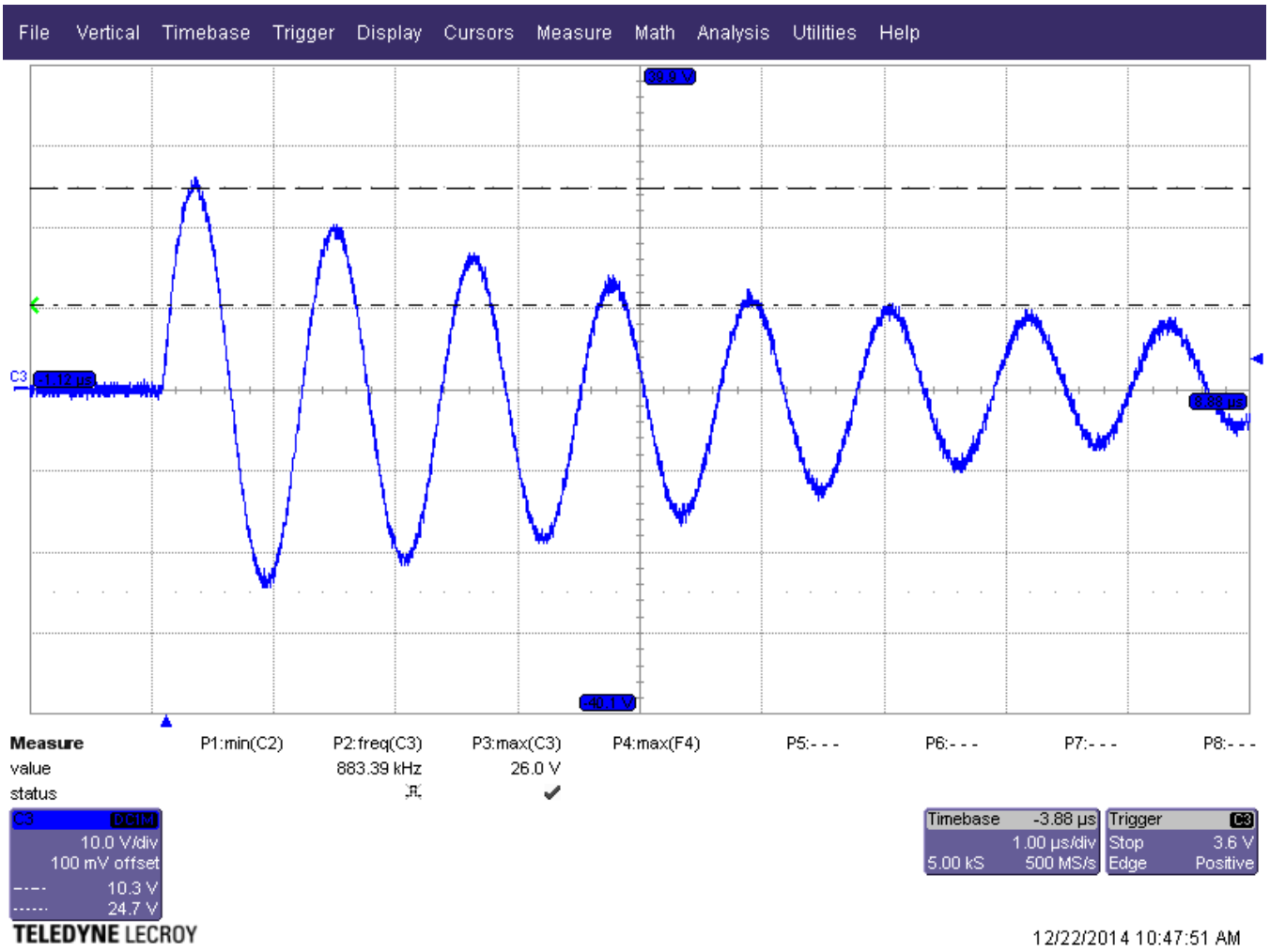
Horizontal	Time / Pt	2.000 ns	Sampling Mode	RealTime
	Pts / Div	500.0 S	Trigger Delay	-3.88 µs
Trigger	Mode	Stop	Slope	Positive
	Type	Edge	Level	3.6 V
	Source	C3	Coupling	DC

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 10:47:43 AM

Pin WF3 Level 3 Short Circuit Verification - Positive

DLS EMC & Product Safety Testing • Consulting

WF3 Pin Injection
Short Circuit Verification
Level 3 600V/24A
f=1MHz +-20%
5th-25%-75% of 1st
Gen = 670



Channel Status

		C3
Vertical	V / Div	10.0 V
	Offset	100 mV
	Coupling	DC1MΩ
	BW-Limit	Full
	Probe	100.000
	Sweeps	1 #

Acquisition Status

Time / Div	1.00 µs	Sampling Rate	500 MS/s

Horizontal	Time / Pt	2.000 ns	Sampling Mode	RealTime
	Pts / Div	500.0 S	Trigger Delay	-3.88 µs
Trigger	Mode	Stop	Slope	Positive
	Type	Edge	Level	3.6 V
	Source	C3	Coupling	DC

SECTION 22

PIN INJECTION

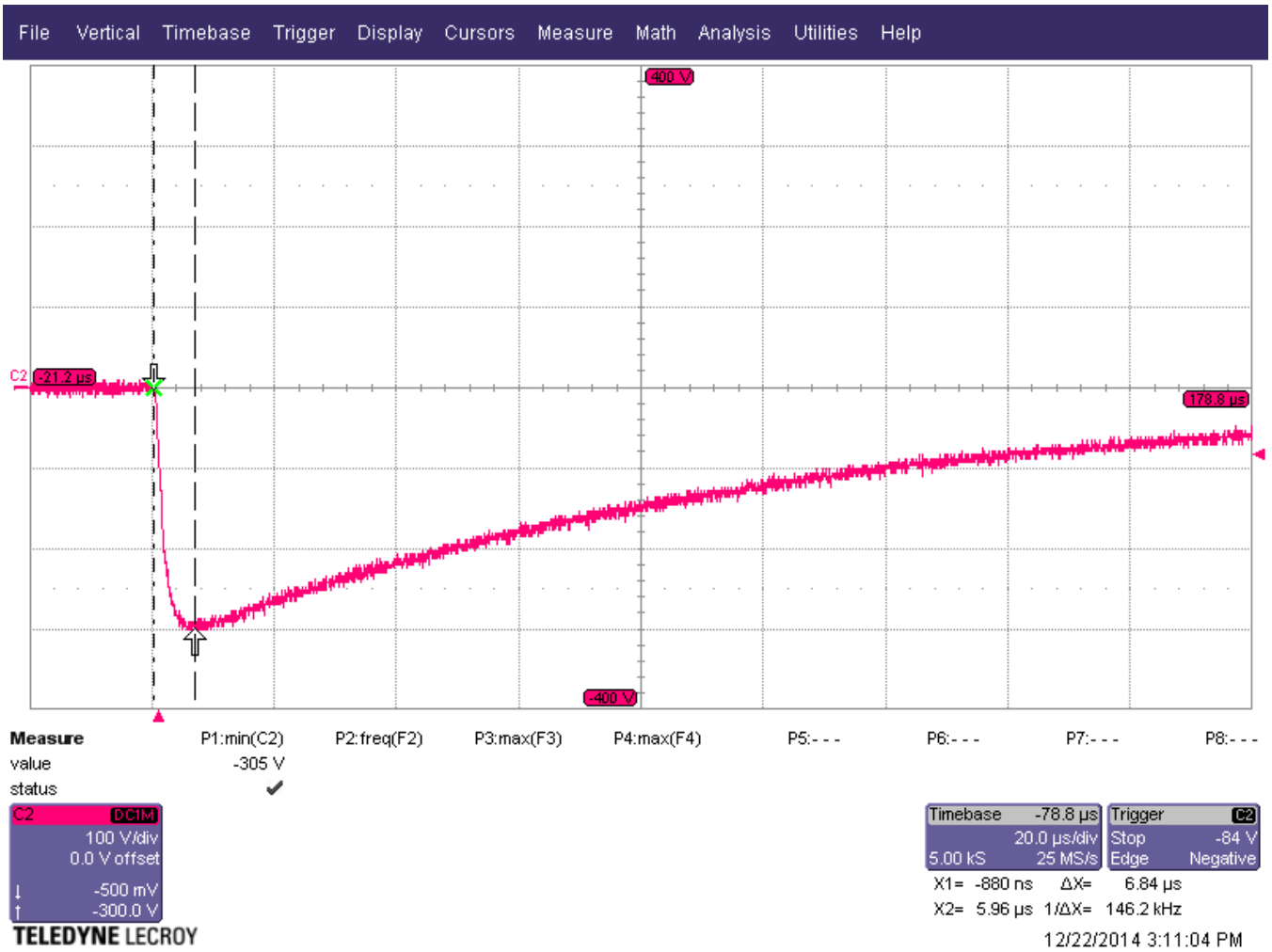
WF4 VERIFICATION DATA SHEETS

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 3:10:54 PM

Pin WF4 Level 3 Open Circuit Verification - Negative T1

DLS EMC & Product Safety Testing • Consulting

WF4 Pin Injection (Direct Injection)
Open Circuit Verification
Level 3 300V/60A
T1 = 6.4uS (+/- 20%)
T2 = 69uS (+/- 20%)
Gen = 300



Channel Status

		C2
Vertical	V / Div	100 V
	Offset	0.0 V
	Coupling	DC1MΩ
	BW-Limit	Full
	Probe	1.000e+3
	Sweeps	1 #

Acquisition Status

Time / Div	20.0 µs	Sampling Rate	25 MS/s

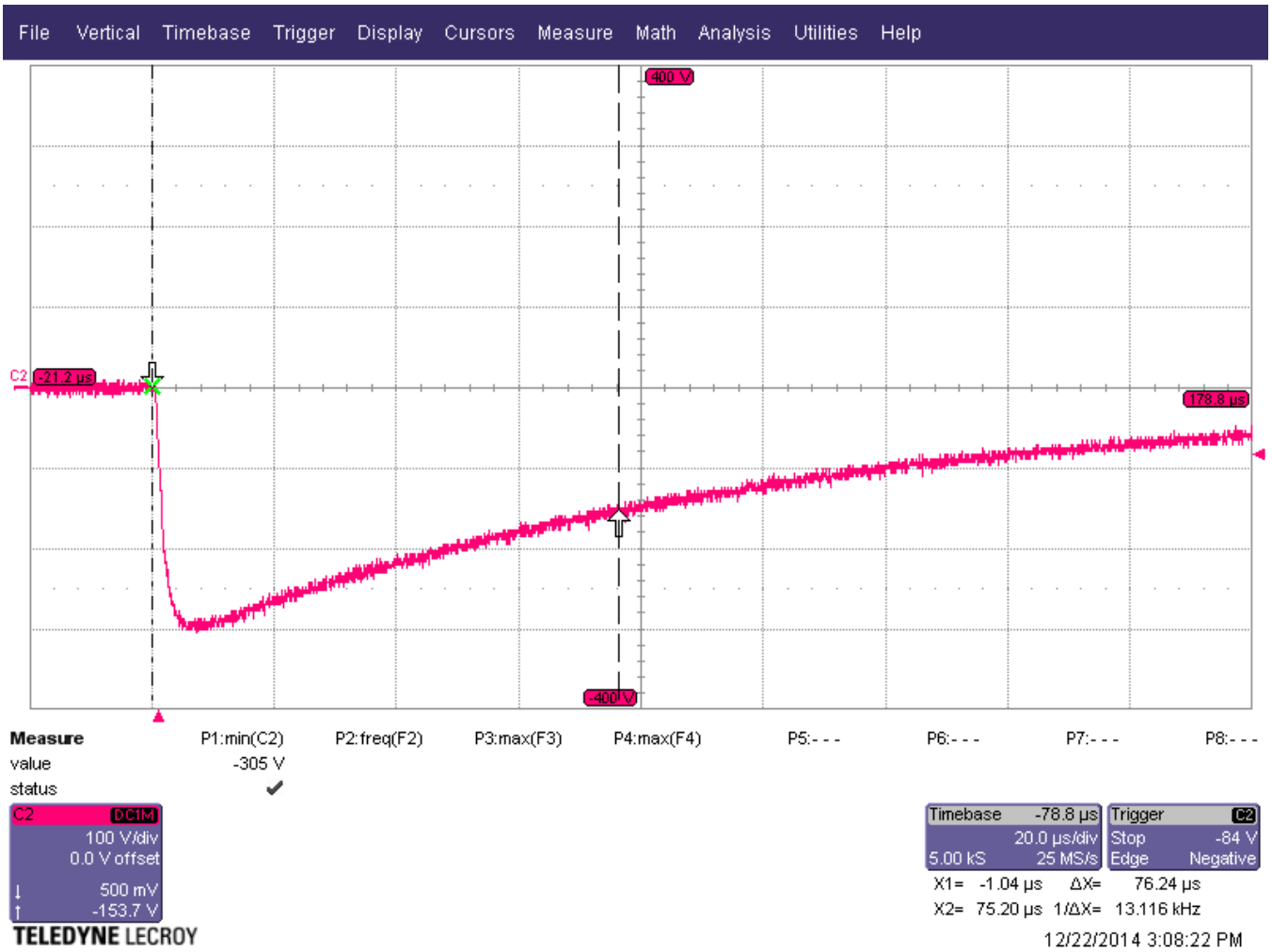
Horizontal	Time / Pt	40.000 ns	Sampling Mode	RealTime
	Pts / Div	500.0 S	Trigger Delay	-78.8 µs
Trigger	Mode	Stop	Slope	Negative
	Type	Edge	Level	-84 V
	Source	C2	Coupling	DC

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 3:08:10 PM

Pin WF4 Level 3 Open Circuit Verification - Negative T2

DLS EMC & Product Safety Testing • Consulting

WF4 Pin Injection (Direct Injection)
Open Circuit Verification
Level 3 300V/60A
T1 = 6.4uS (+/- 20%)
T2 = 69uS (+/- 20%)
Gen = 300



Channel Status

		C2
Vertical	V / Div	100 V
	Offset	0.0 V
	Coupling	DC1MΩ
	BW-Limit	Full
	Probe	1.000e+3
	Sweeps	1 #

Acquisition Status

Time / Div	20.0 µs	Sampling Rate	25 MS/s

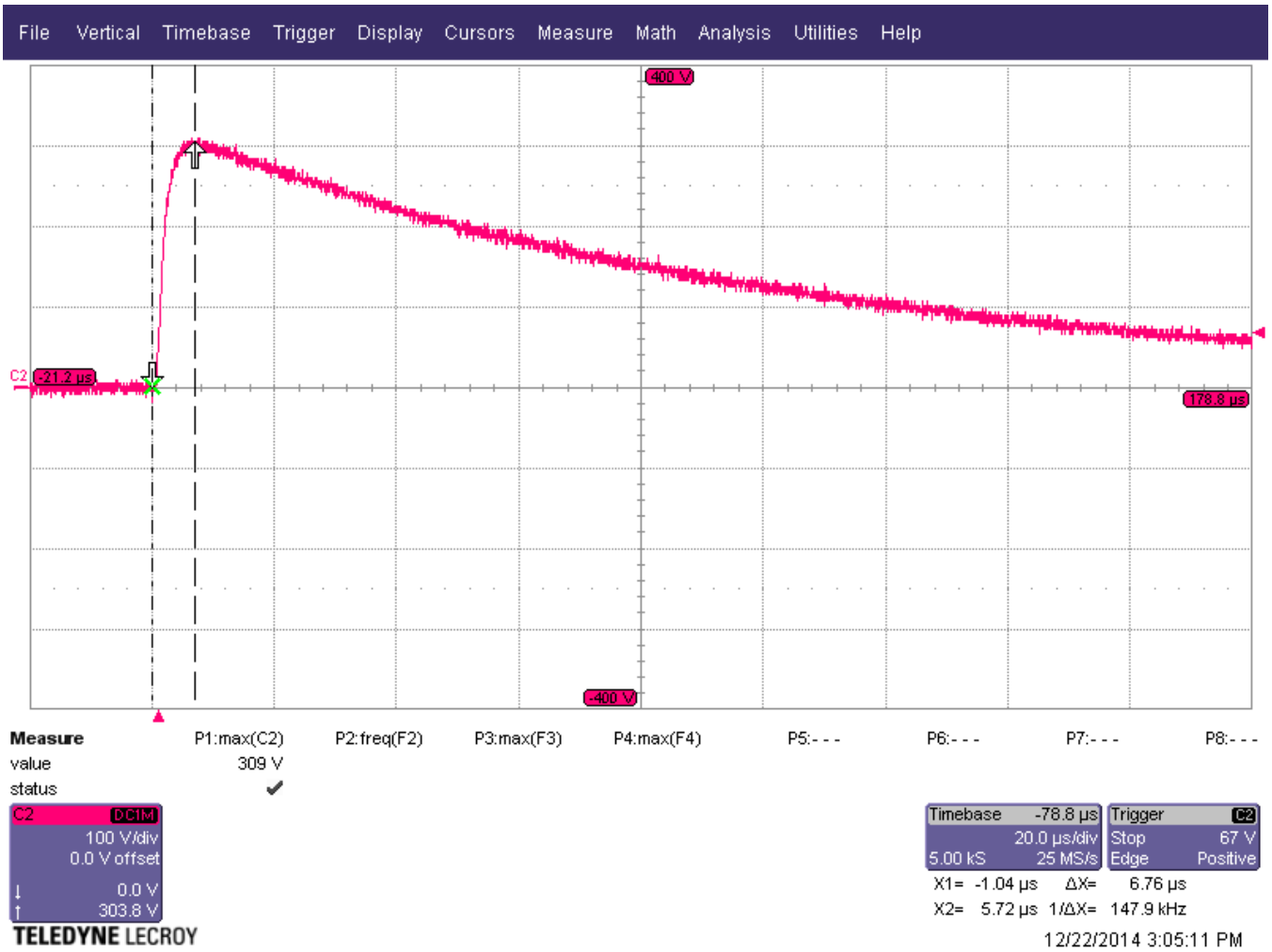
Horizontal	Time / Pt	40.000 ns	Sampling Mode	RealTime
	Pts / Div	500.0 S	Trigger Delay	-78.8 µs
Trigger	Mode	Stop	Slope	Negative
	Type	Edge	Level	-84 V
	Source	C2	Coupling	DC

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 3:04:57 PM

Pin WF4 Level 3 Open Circuit Verification - Positive T1

DLS EMC & Product Safety Testing • Consulting

WF4 Pin Injection (Direct Injection)
Open Circuit Verification
Level 3 300V/60A
T1 = 6.4uS (+/- 20%)
T2 = 69uS (+/- 20%)
Gen = 300



Channel Status

		C2
Vertical	V / Div	100 V
	Offset	0.0 V
	Coupling	DC1MΩ
	BW-Limit	Full
	Probe	1.000e+3
	Sweeps	1 #

Acquisition Status

Time / Div	20.0 µs	Sampling Rate	25 MS/s

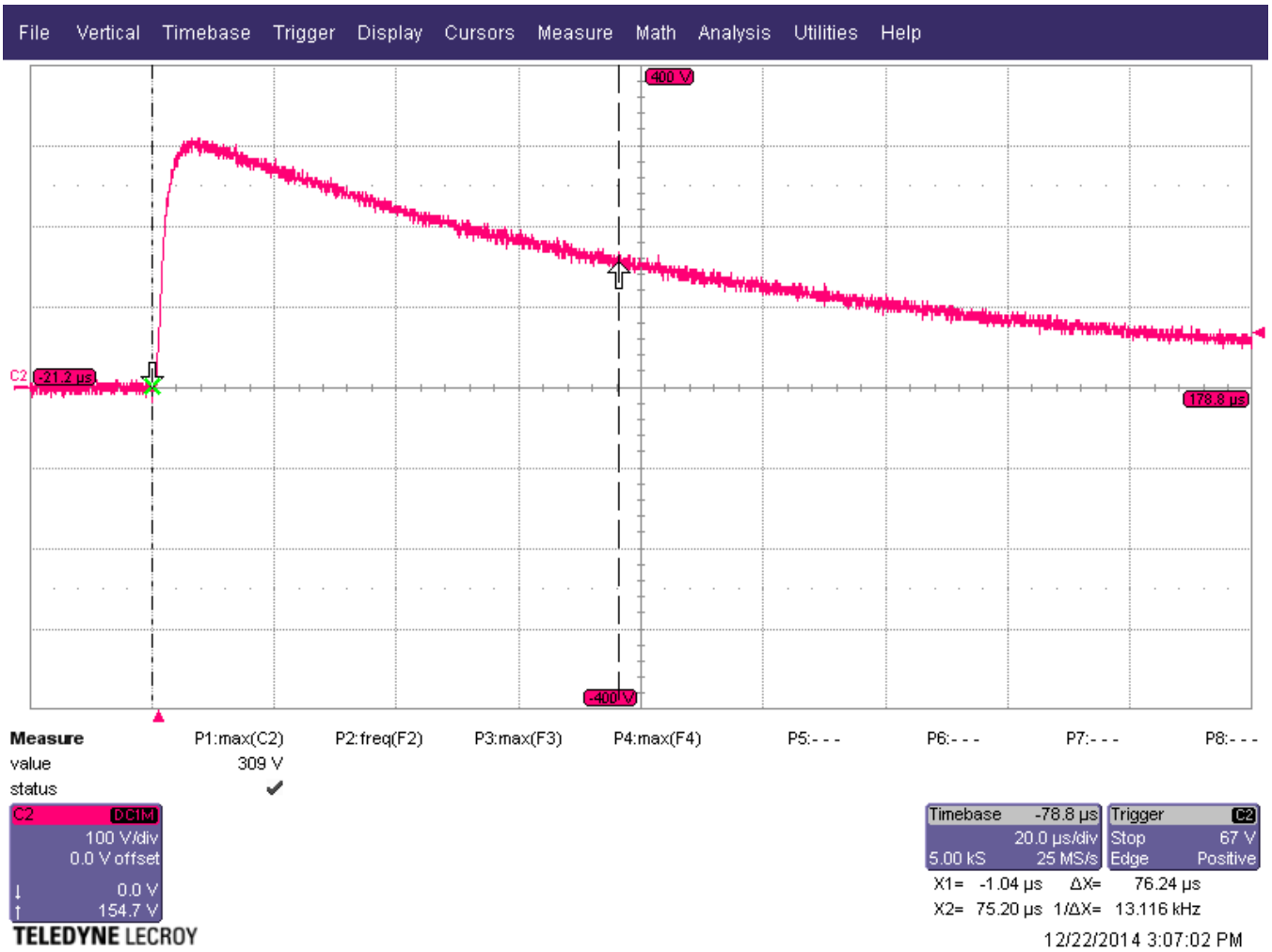
Horizontal	Time / Pt	40.000 ns	Sampling Mode	RealTime
	Pts / Div	500.0 S	Trigger Delay	-78.8 µs
Trigger	Mode	Stop	Slope	Positive
	Type	Edge	Level	67 V
	Source	C2	Coupling	DC

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 3:06:53 PM

Pin WF4 Level 3 Open Circuit Verification - Positive T2

EMC & Product Safety Testing • Consulting

WF4 Pin Injection (Direct Injection)
Open Circuit Verification
Level 3 300V/60A
T1 = 6.4uS (+/- 20%)
T2 = 69uS (+/- 20%)
Gen = 300



Channel Status

		C2
Vertical	V / Div	100 V
	Offset	0.0 V
	Coupling	DC1MΩ
	BW-Limit	Full
	Probe	1.000e+3
	Sweeps	1 #

Acquisition Status

Time / Div	20.0 µs	Sampling Rate	25 MS/s

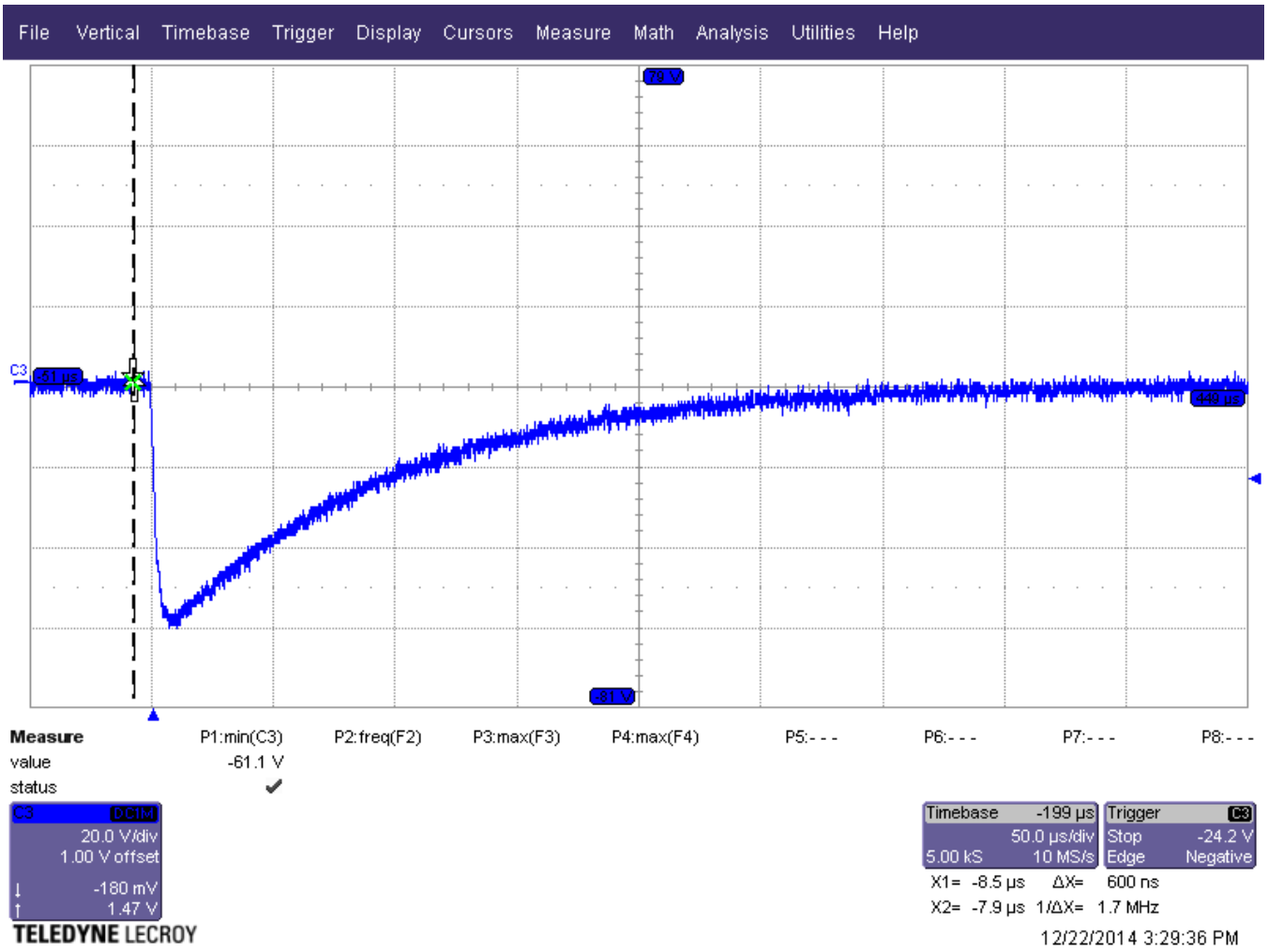
Horizontal	Time / Pt	40.000 ns	Sampling Mode	RealTime
	Pts / Div	500.0 S	Trigger Delay	-78.8 µs
Trigger	Mode	Stop	Slope	Positive
	Type	Edge	Level	67 V
	Source	C2	Coupling	DC

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 3:29:26 PM

Pin WF4 Level 3 Short Circuit Verification - Negative

EMC & Product Safety Testing • Consulting

WF4 Pin Injection (Direct Injection)
Short Circuit Verification
Level 3 300V/60A
Gen = 300



Channel Status

		C3
Vertical	V / Div	20.0 V
	Offset	1.00 V
	Coupling	DC1MΩ
	BW-Limit	Full
	Probe	100.000
	Sweeps	1 #

Acquisition Status

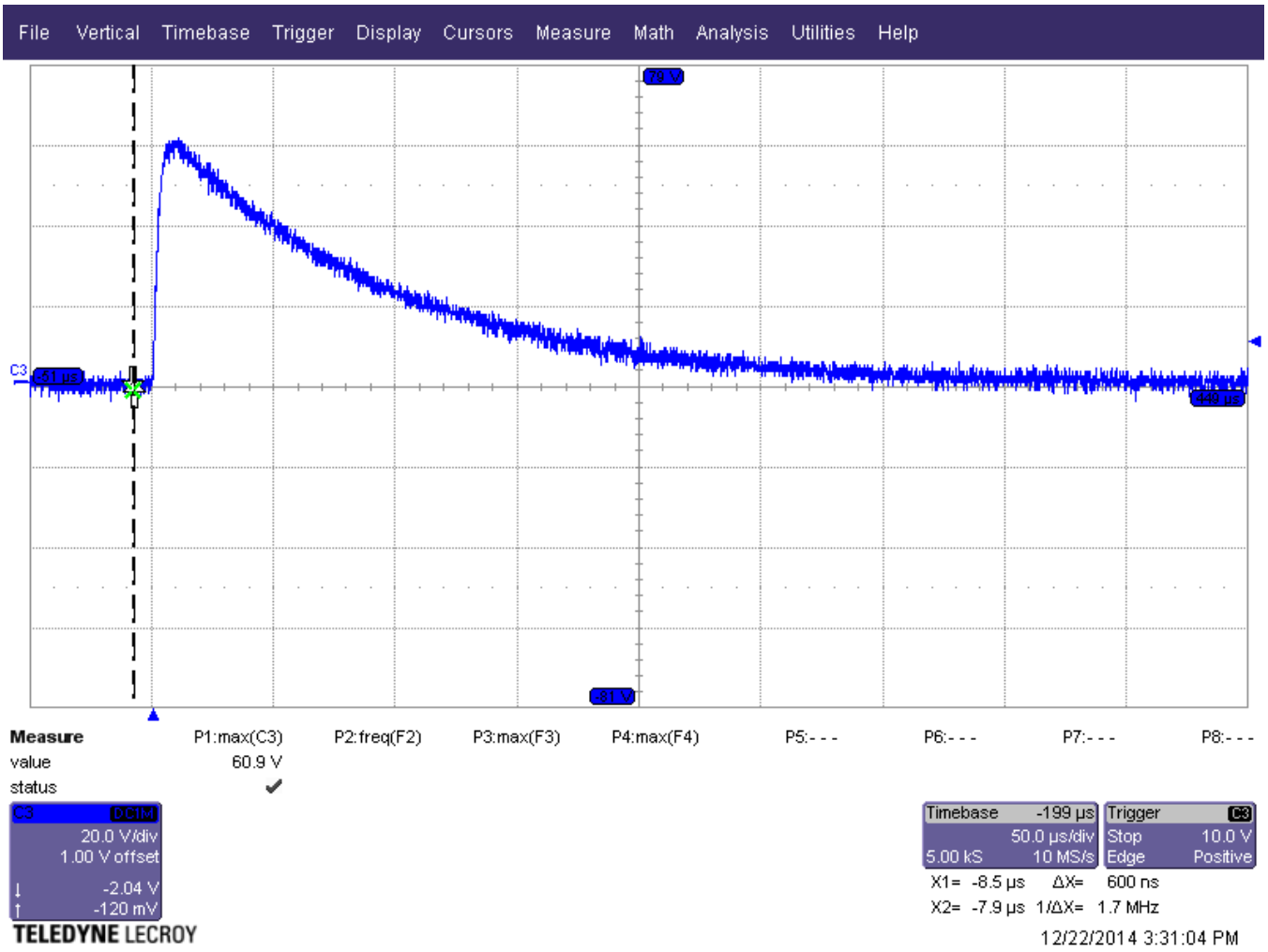
Horizontal	Time / Div	50.0 µs	Sampling Rate	10 MS/s
	Time / Pt	100.000 ns	Sampling Mode	RealTime

	Pts / Div	500.0 S	Trigger Delay	-199 µs
	Mode	Stop	Slope	Negative
Trigger	Type	Edge	Level	-24.2 V
	Source	C3	Coupling	DC

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 3:30:55 PM

Pin WF4 Level 3 Short Circuit Verification - Positive

WF4 Pin Injection (Direct Injection)
Short Circuit Verification
Level 3 300V/60A
Gen = 300



Channel Status

		C3
Vertical	V / Div	20.0 V
	Offset	1.00 V
	Coupling	DC1MΩ
	BW-Limit	Full
	Probe	100.000
	Sweeps	1 #

Acquisition Status

Horizontal	Time / Div	50.0 µs	Sampling Rate	10 MS/s
	Time / Pt	100.000 ns	Sampling Mode	RealTime

	Pts / Div	500.0 S	Trigger Delay	-199 µs
	Mode	Stop	Slope	Positive
Trigger	Type	Edge	Level	10.0 V
	Source	C3	Coupling	DC

SECTION 22

PIN INJECTION

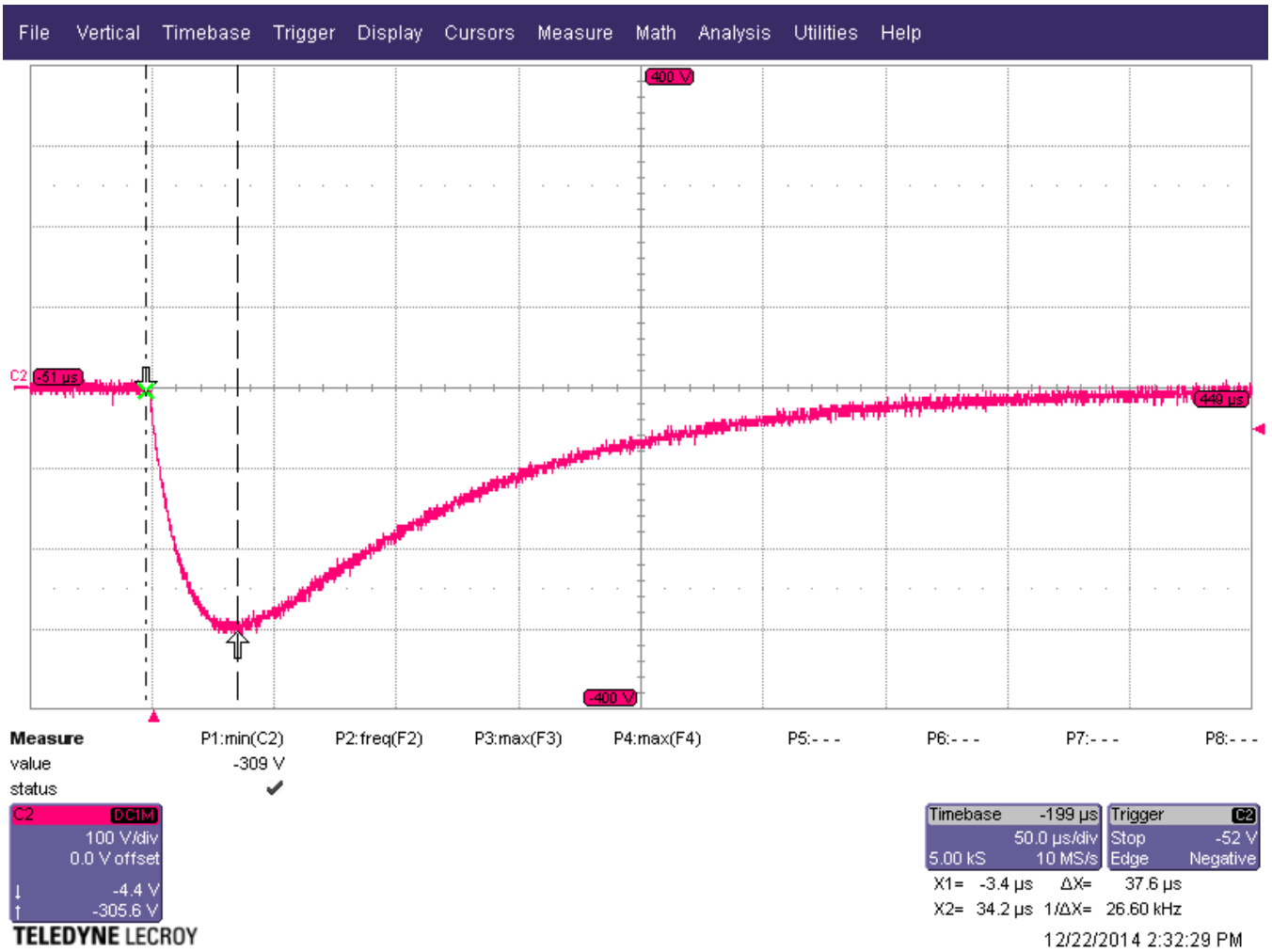
WF5A VERIFICATION DATA SHEETS

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 2:32:20 PM

Pin WF5A Level 3 Open Circuit Verification T1 - Negative

DLS EMC & Product Safety Testing • Consulting

WF5A Pin Injection (Direct Injection)
Open Circuit Verification
Level 3 300V/300A
T1 = 40uS (+/- 20%)
T2 = 120uS (+/- 20%)
Gen = 300



Channel Status

		C2
Vertical	V / Div	100 V
	Offset	0.0 V
	Coupling	DC1MΩ
	BW-Limit	Full
	Probe	1.000e+3
	Sweeps	1 #

Acquisition Status

Time / Div	50.0 µs	Sampling Rate	10 MS/s

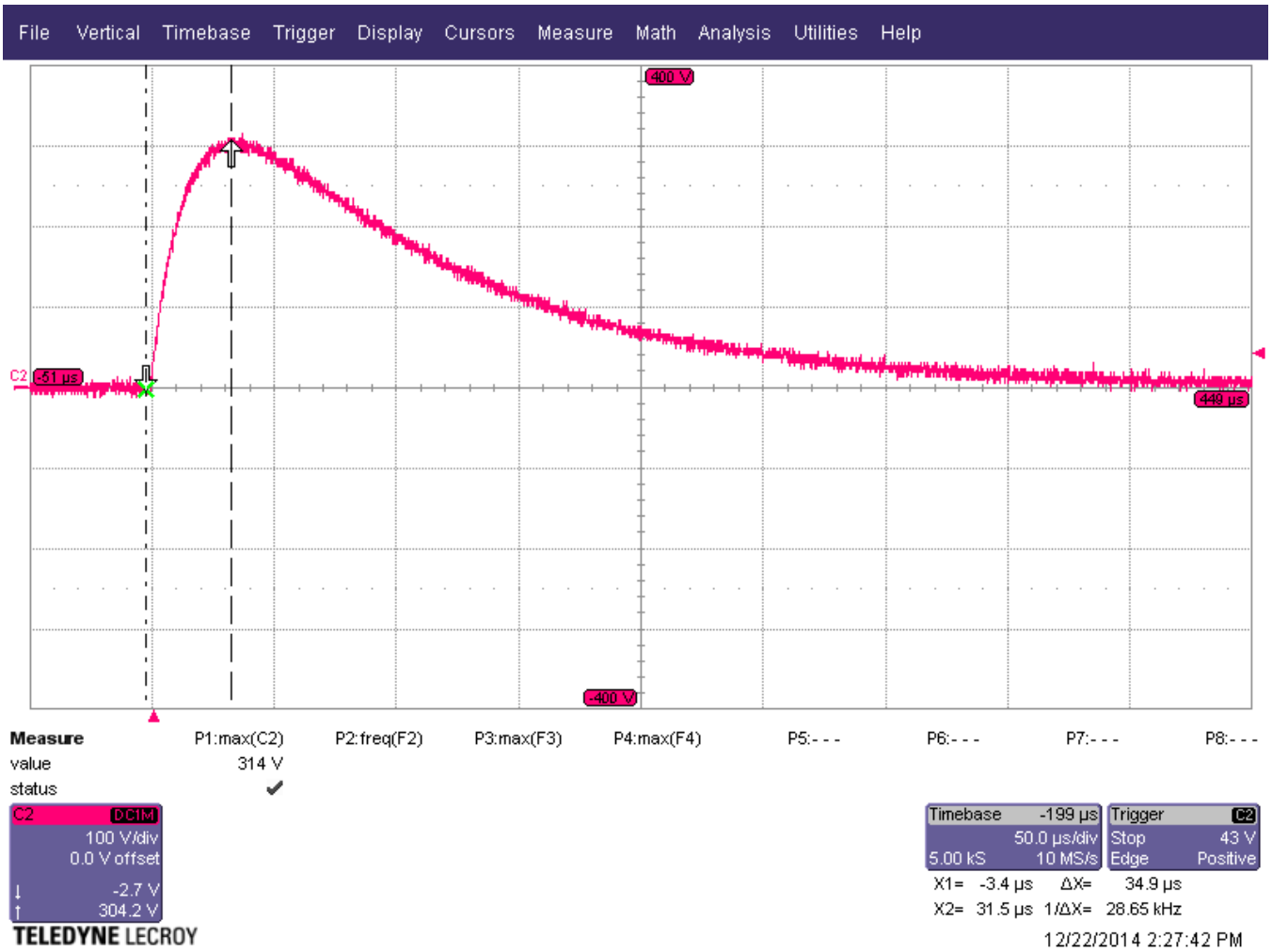
Horizontal	Time / Pt	100.000 ns	Sampling Mode	RealTime
	Pts / Div	500.0 S	Trigger Delay	-199 µs
Trigger	Mode	Stop	Slope	Negative
	Type	Edge	Level	-52 V
	Source	C2	Coupling	DC

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 2:27:30 PM

Pin WF5A Level 3 Open Circuit Verification T1 - Positive

DLS EMC & Product Safety Testing • Consulting

WF5A Pin Injection (Direct Injection)
Open Circuit Verification
Level 3 300V/300A
T1 = 40uS (+/- 20%)
T2 = 120uS (+/- 20%)
Gen = 300



Channel Status

		C2
Vertical	V / Div	100 V
	Offset	0.0 V
	Coupling	DC1MΩ
	BW-Limit	Full
	Probe	1.000e+3
	Sweeps	1 #

Acquisition Status

Time / Div	50.0 µs	Sampling Rate	10 MS/s

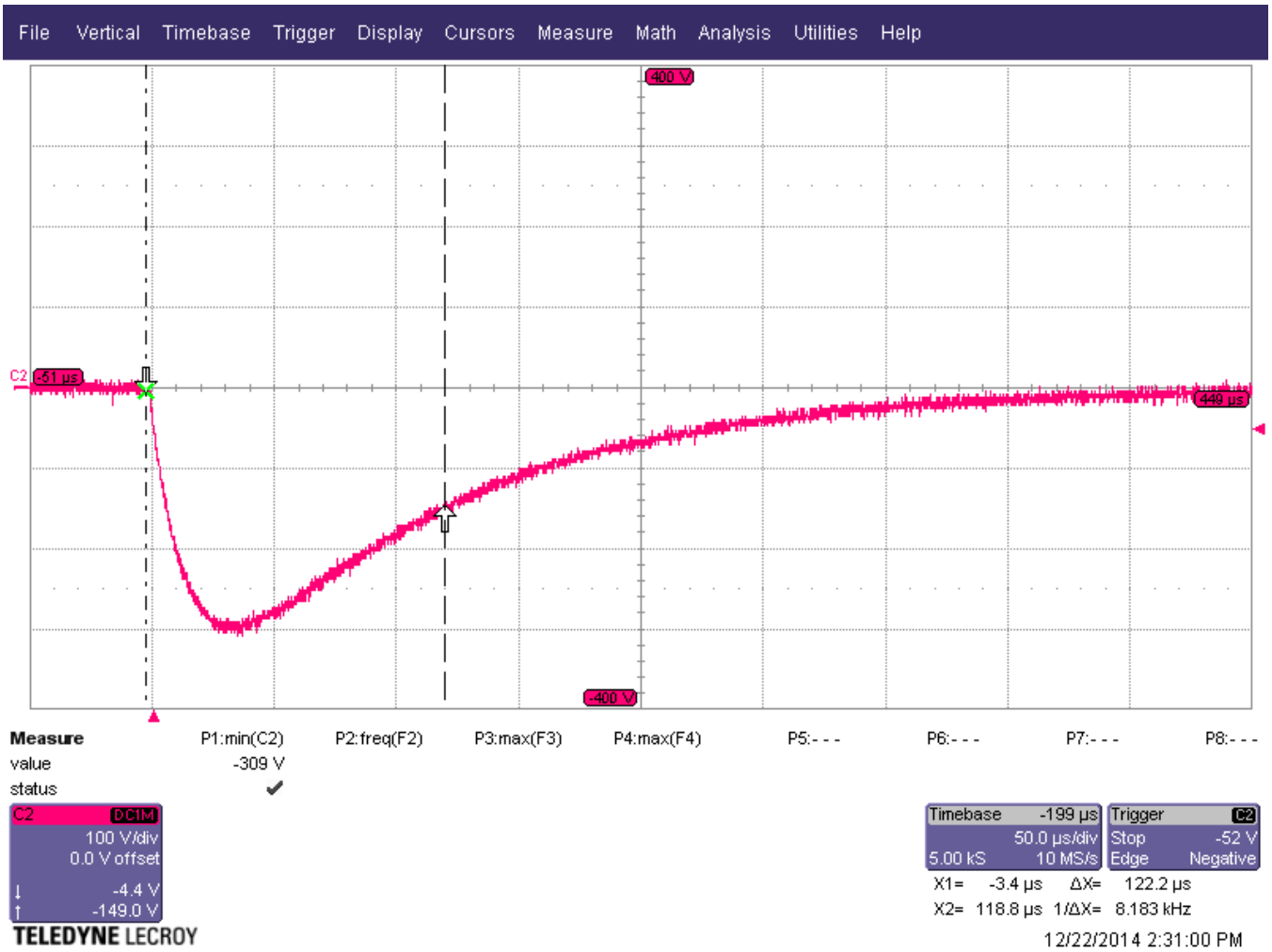
Horizontal	Time / Pt	100.000 ns	Sampling Mode	RealTime
	Pts / Div	500.0 S	Trigger Delay	-199 µs
Trigger	Mode	Stop	Slope	Positive
	Type	Edge	Level	43 V
	Source	C2	Coupling	DC

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 2:30:47 PM

Pin WF5A Level 3 Open Circuit Verification T2 - Negative

EMC & Product Safety Testing • Consulting

WF5A Pin Injection (Direct Injection)
Open Circuit Verification
Level 3 300V/300A
T1 = 40uS (+/- 20%)
T2 = 120uS (+/- 20%)
Gen = 300



Channel Status

		C2
Vertical	V / Div	100 V
	Offset	0.0 V
	Coupling	DC1MΩ
	BW-Limit	Full
	Probe	1.000e+3
	Sweeps	1 #

Acquisition Status

Time / Div	50.0 µs	Sampling Rate	10 MS/s

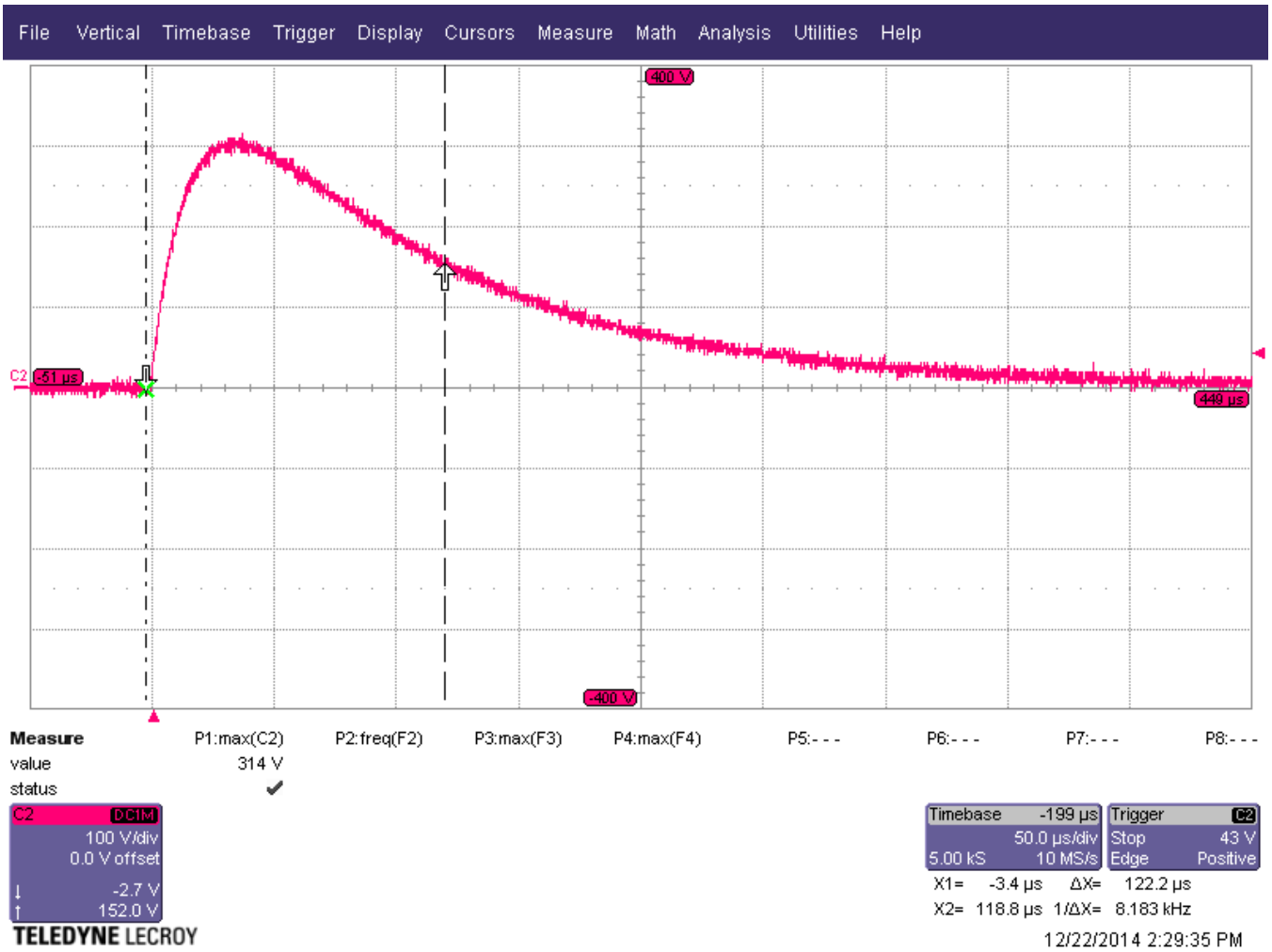
Horizontal	Time / Pt	100.000 ns	Sampling Mode	RealTime
	Pts / Div	500.0 S	Trigger Delay	-199 µs
Trigger	Mode	Stop	Slope	Negative
	Type	Edge	Level	-52 V
	Source	C2	Coupling	DC

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 2:29:23 PM

Pin WF5A Level 3 Open Circuit Verification T2 - Positive

DLS EMC & Product Safety Testing • Consulting

WF5A Pin Injection (Direct Injection)
Open Circuit Verification
Level 3 300V/300A
T1 = 40uS (+/- 20%)
T2 = 120uS (+/- 20%)
Gen = 300



Channel Status

		C2
Vertical	V / Div	100 V
	Offset	0.0 V
	Coupling	DC1MΩ
	BW-Limit	Full
	Probe	1.000e+3
	Sweeps	1 #

Acquisition Status

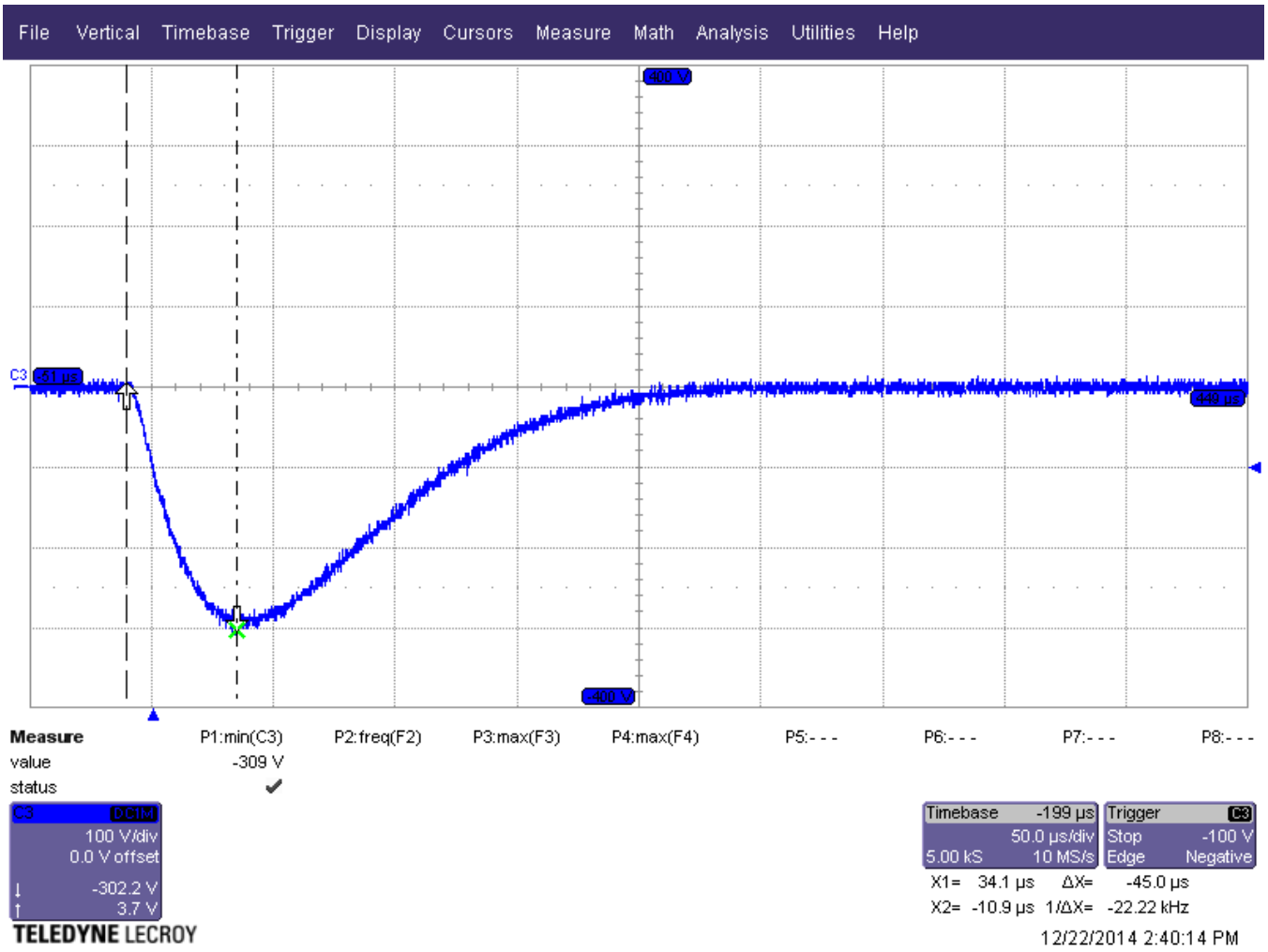
Time / Div	50.0 µs	Sampling Rate	10 MS/s

Horizontal	Time / Pt	100.000 ns	Sampling Mode	RealTime
	Pts / Div	500.0 S	Trigger Delay	-199 µs
Trigger	Mode	Stop	Slope	Positive
	Type	Edge	Level	43 V
	Source	C2	Coupling	DC

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 2:40:04 PM

Pin WF5A Level 3 Short Circuit Verification - Negative

WF5A Pin Injection (Direct Injection)
Short Circuit Verification
Level 3 300V/300A
Gen = 300



Channel Status

		C3
Vertical	V / Div	100 V
	Offset	0.0 V
	Coupling	DC1MΩ
	BW-Limit	Full
	Probe	100.000
	Sweeps	1 #

Acquisition Status

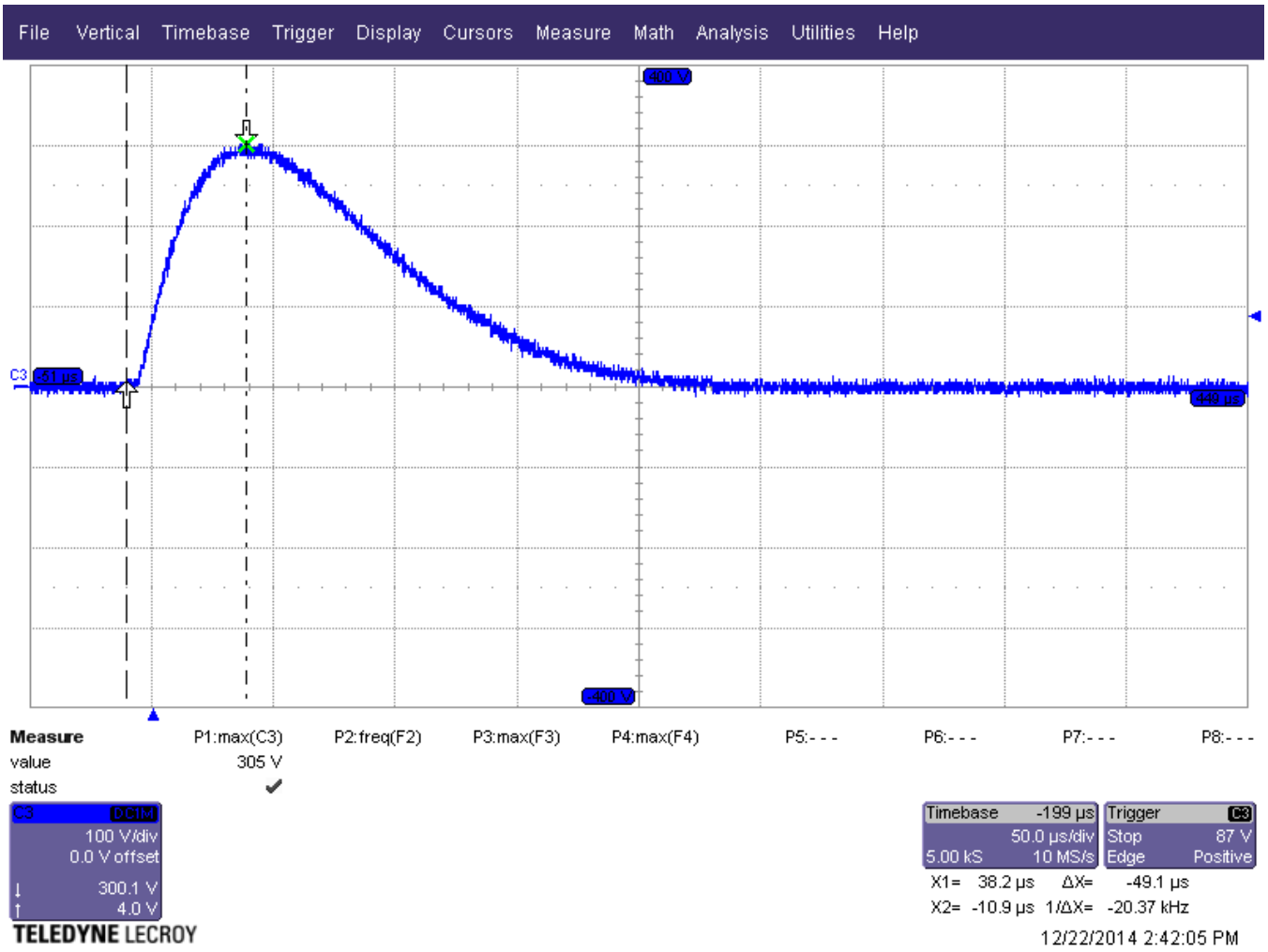
Horizontal	Time / Div	50.0 µs	Sampling Rate	10 MS/s
	Time / Pt	100.000 ns	Sampling Mode	RealTime

	Pts / Div	500.0 S	Trigger Delay	-199 µs
	Mode	Stop	Slope	Negative
Trigger	Type	Edge	Level	-100 V
	Source	C3	Coupling	DC

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 2:41:56 PM

Pin WF5A Level 3 Short Circuit Verification - Positive

WF5A Pin Injection (Direct Injection)
Short Circuit Verification
Level 3 300V/300A
Gen = 300



Channel Status

		C3
Vertical	V / Div	100 V
	Offset	0.0 V
	Coupling	DC1MΩ
	BW-Limit	Full
	Probe	100.000
	Sweeps	1 #

Acquisition Status

Horizontal	Time / Div	50.0 µs	Sampling Rate	10 MS/s
	Time / Pt	100.000 ns	Sampling Mode	RealTime

	Pts / Div	500.0 S	Trigger Delay	-199 µs
	Mode	Stop	Slope	Positive
Trigger	Type	Edge	Level	87 V
	Source	C3	Coupling	DC

SECTION 22

PIN INJECTION

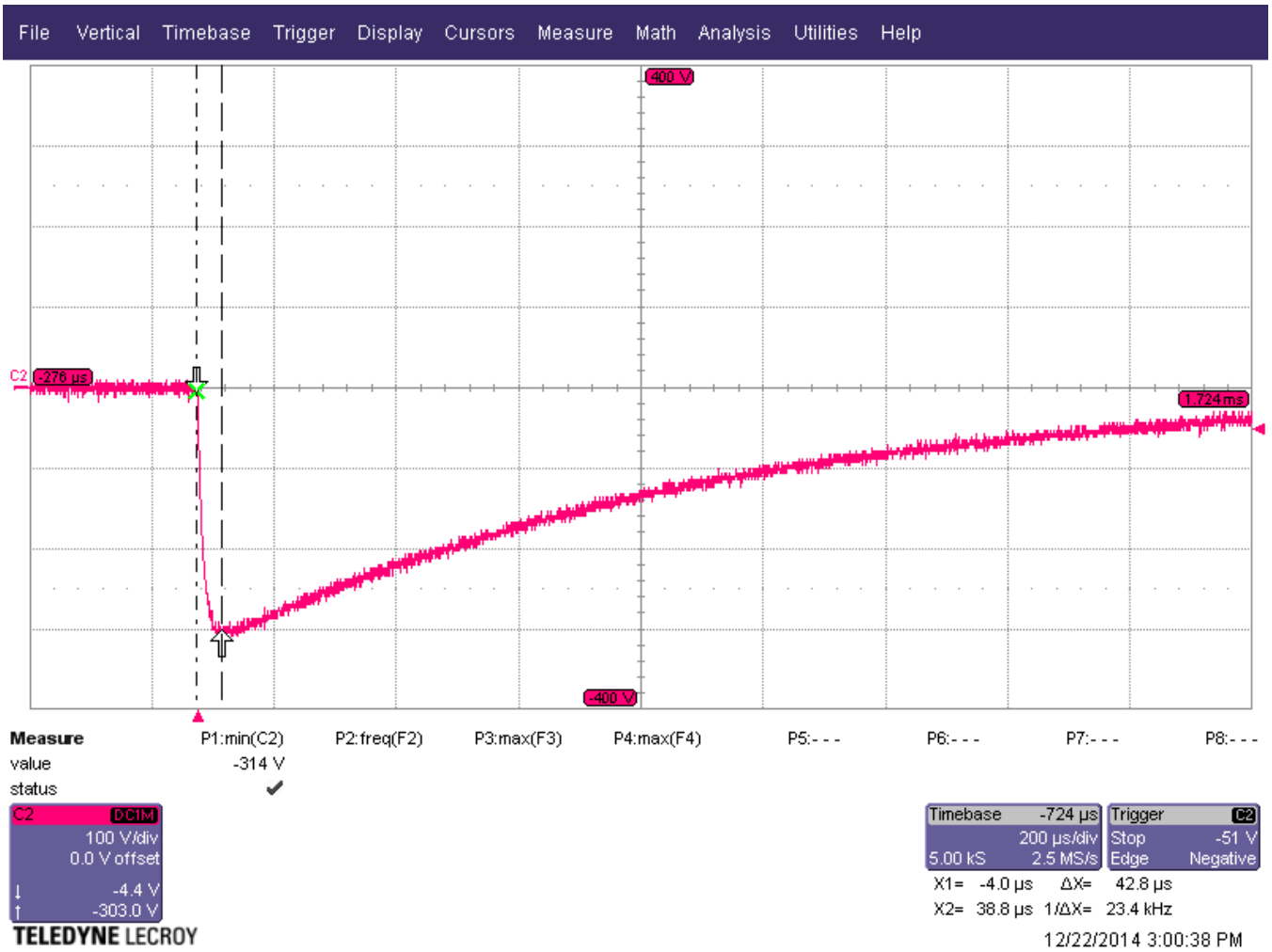
WF5B VERIFICATION DATA SHEETS

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 3:00:29 PM

Pin WF5B Level 3 Open Circuit Verification T1 - Negative

DLS EMC & Product Safety Testing • Consulting

WF5B Pin Injection (Direct Injection)
Open Circuit Verification
Level 3 300V/300A
T1 = 50uS (+/- 20%)
T2 = 500uS (+/- 20%)
Gen = 300



Channel Status

		C2
Vertical	V / Div	100 V
	Offset	0.0 V
	Coupling	DC1MΩ
	BW-Limit	Full
	Probe	1.000e+3
	Sweeps	1 #

Acquisition Status

Time / Div	200 µs	Sampling Rate	2.5 MS/s

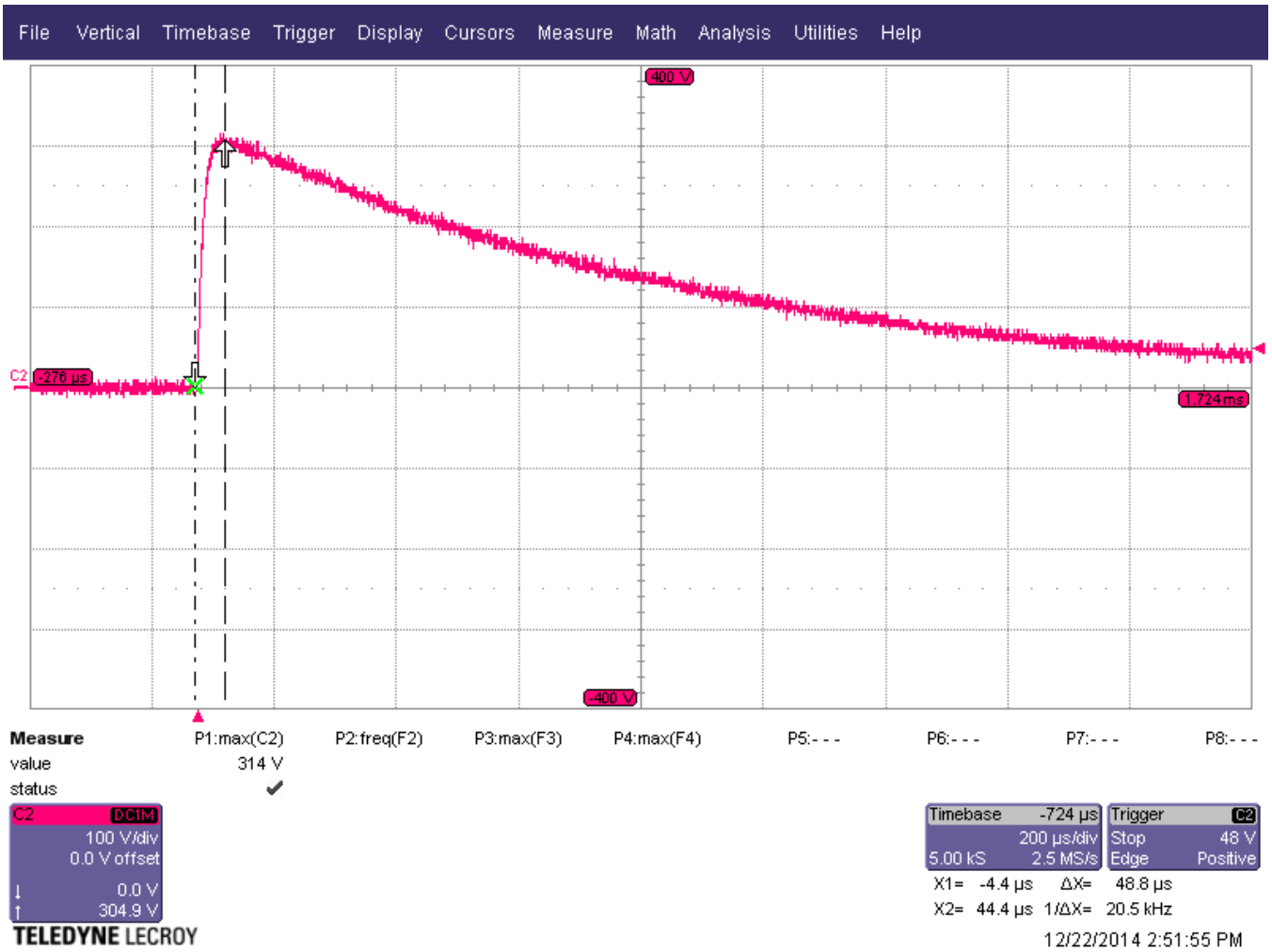
Horizontal	Time / Pt	400.000 ns	Sampling Mode	RealTime
	Pts / Div	500.0 S	Trigger Delay	-724 µs
Trigger	Mode	Stop	Slope	Negative
	Type	Edge	Level	-51 V
	Source	C2	Coupling	DC

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 2:51:44 PM

Pin WF5B Level 3 Open Circuit Verification T1 - Positive

DLS EMC & Product Safety Testing • Consulting

WF5B Pin Injection (Direct Injection)
Open Circuit Verification
Level 3 300V/300A
T1 = 50uS (+/- 20%)
T2 = 500uS (+/- 20%)
Gen = 300



Channel Status

		C2
Vertical	V / Div	100 V
	Offset	0.0 V
	Coupling	DC1MΩ
	BW-Limit	Full
	Probe	1.000e+3
	Sweeps	1 #

Acquisition Status

Time / Div	200 µs	Sampling Rate	2.5 MS/s

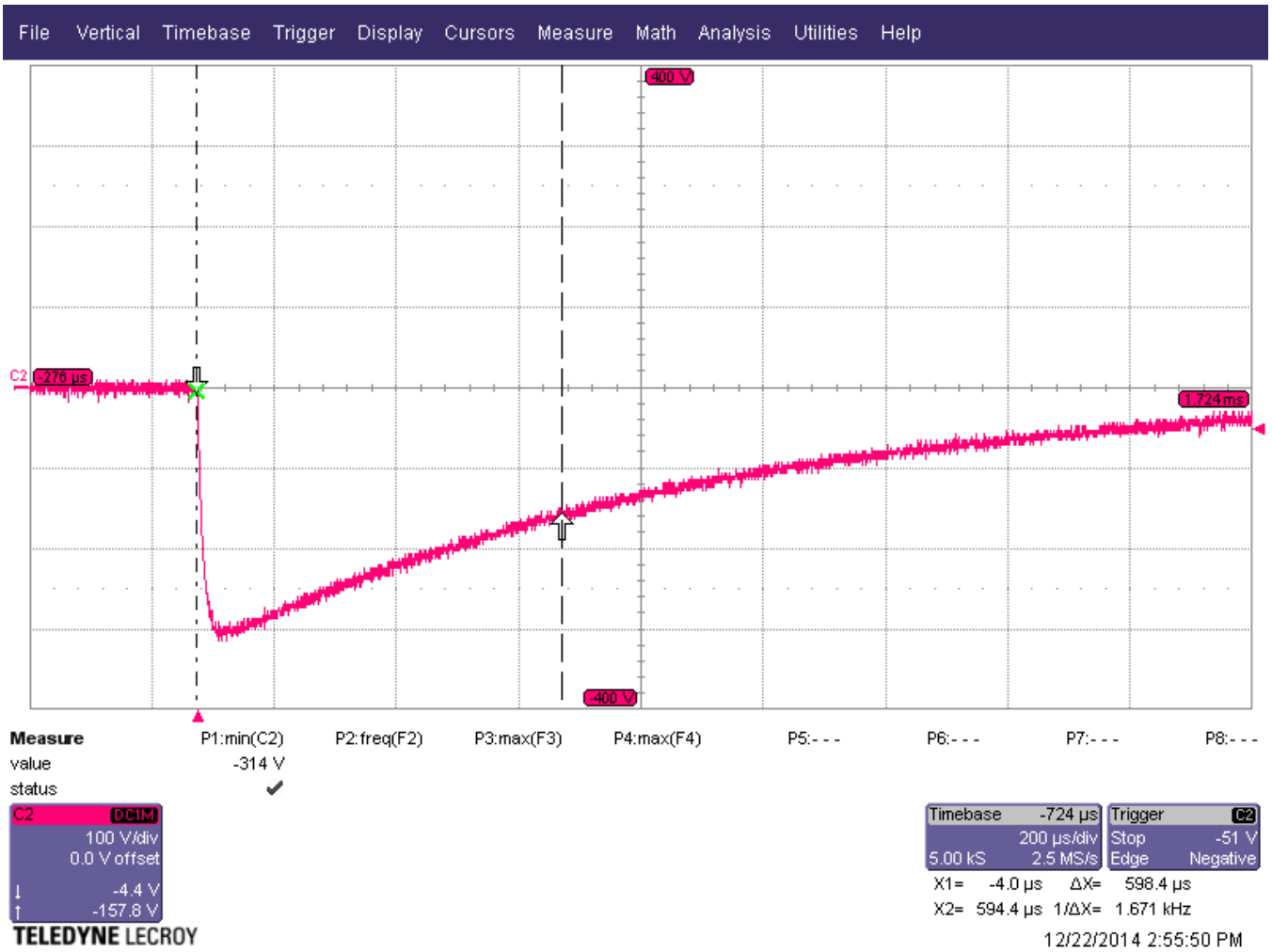
Horizontal	Time / Pt	400.000 ns	Sampling Mode	RealTime
	Pts / Div	500.0 S	Trigger Delay	-724 µs
Trigger	Mode	Stop	Slope	Positive
	Type	Edge	Level	48 V
	Source	C2	Coupling	DC

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 2:55:39 PM

Pin WF5B Level 3 Open Circuit Verification T2 - Negative

EMC & Product Safety Testing • Consulting

WF5B Pin Injection (Direct Injection)
Open Circuit Verification
Level 3 300V/300A
T1 = 50uS (+/- 20%)
T2 = 500uS (+/- 20%)
Gen = 300



Channel Status

		C2
Vertical	V / Div	100 V
	Offset	0.0 V
	Coupling	DC1MΩ
	BW-Limit	Full
	Probe	1.000e+3
	Sweeps	1 #

Acquisition Status

Time / Div	200 µs	Sampling Rate	2.5 MS/s

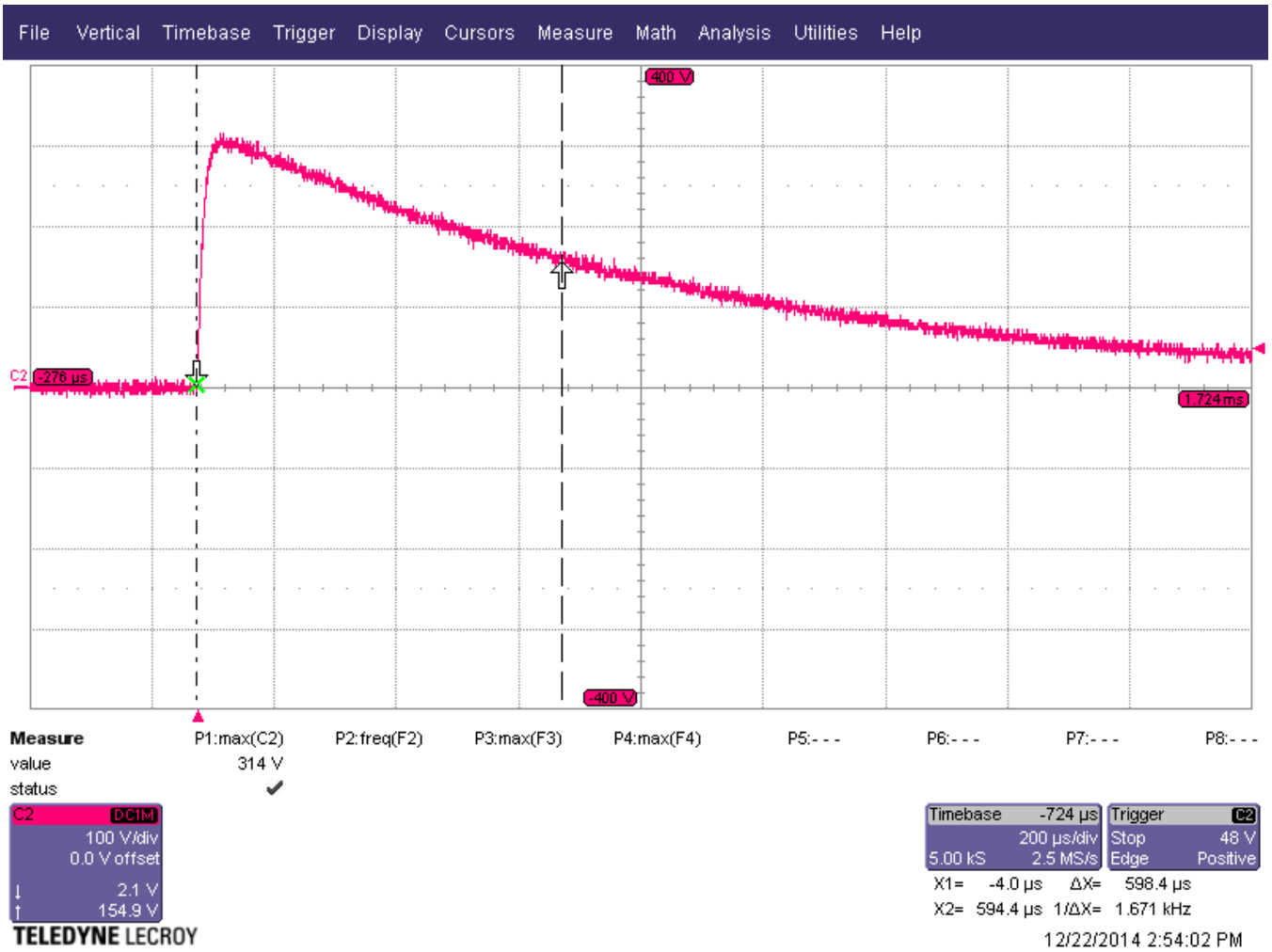
Horizontal	Time / Pt	400.000 ns	Sampling Mode	RealTime
	Pts / Div	500.0 S	Trigger Delay	-724 µs
Trigger	Mode	Stop	Slope	Negative
	Type	Edge	Level	-51 V
	Source	C2	Coupling	DC

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 2:53:51 PM

Pin WF5B Level 3 Open Circuit Verification T2 - Positive

DLS EMC & Product Safety Testing • Consulting

WF5B Pin Injection (Direct Injection)
Open Circuit Verification
Level 3 300V/300A
T1 = 50uS (+/- 20%)
T2 = 500uS (+/- 20%)
Gen = 300



Channel Status

		C2
Vertical	V / Div	100 V
	Offset	0.0 V
	Coupling	DC1MΩ
	BW-Limit	Full
	Probe	1.000e+3
	Sweeps	1 #

Acquisition Status

Time / Div	200 µs	Sampling Rate	2.5 MS/s

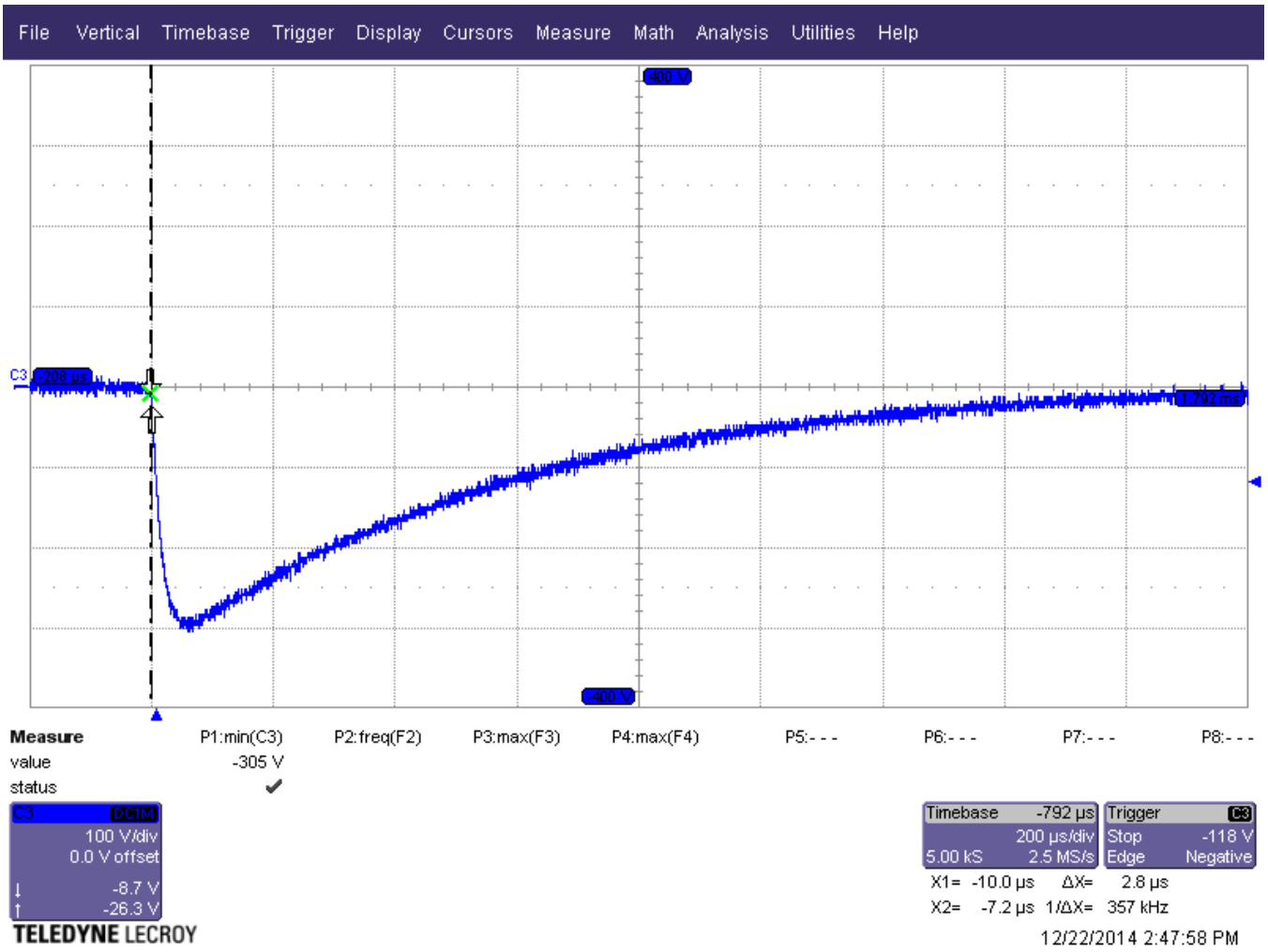
Horizontal	Time / Pt	400.000 ns	Sampling Mode	RealTime
	Pts / Div	500.0 S	Trigger Delay	-724 µs
Trigger	Mode	Stop	Slope	Positive
	Type	Edge	Level	48 V
	Source	C2	Coupling	DC

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 2:47:47 PM

Pin WF5B Level 3 Short Circuit Verification - Negative

EMC & Product Safety Testing • Consulting

WF5B Pin Injection (Direct Injection)
Short Circuit Verification
Level 3 300V/300A
Gen = 300



Channel Status

		C3
Vertical	V / Div	100 V
	Offset	0.0 V
	Coupling	DC1MΩ
	BW-Limit	Full
	Probe	100.000
	Sweeps	1 #

Acquisition Status

Horizontal	Time / Div	200 µs	Sampling Rate	2.5 MS/s
	Time / Pt	400.000 ns	Sampling Mode	RealTime

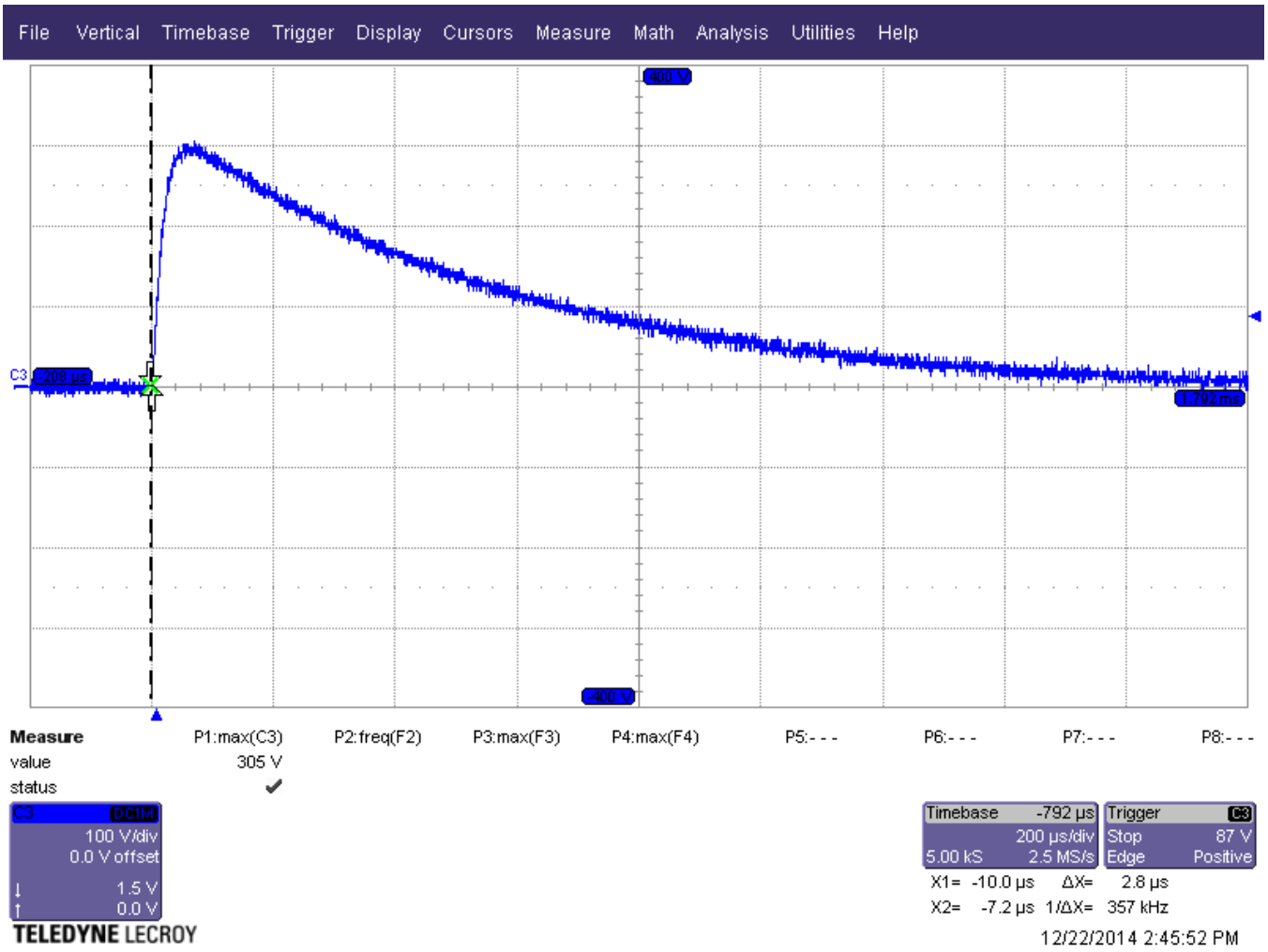
	Pts / Div	500.0 S	Trigger Delay	-792 µs
	Mode	Stop	Slope	Negative
Trigger	Type	Edge	Level	-118 V
	Source	C3	Coupling	DC

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 2:45:42 PM

Pin WF5B Level 3 Short Circuit Verification - Positive

EMC & Product Safety Testing • Consulting

WF5B Pin Injection (Direct Injection)
Short Circuit Verification
Level 3 300V/300A
Gen = 300



Channel Status

		C3
Vertical	V / Div	100 V
	Offset	0.0 V
	Coupling	DC1MΩ
	BW-Limit	Full
	Probe	100.000
	Sweeps	1 #

Acquisition Status

Horizontal	Time / Div	200 µs	Sampling Rate	2.5 MS/s
	Time / Pt	400.000 ns	Sampling Mode	RealTime

	Pts / Div	500.0 S	Trigger Delay	-792 µs
	Mode	Stop	Slope	Positive
Trigger	Type	Edge	Level	87 V
	Source	C3	Coupling	DC

SECTION 22

PIN INJECTION TEST DATA SHEETS

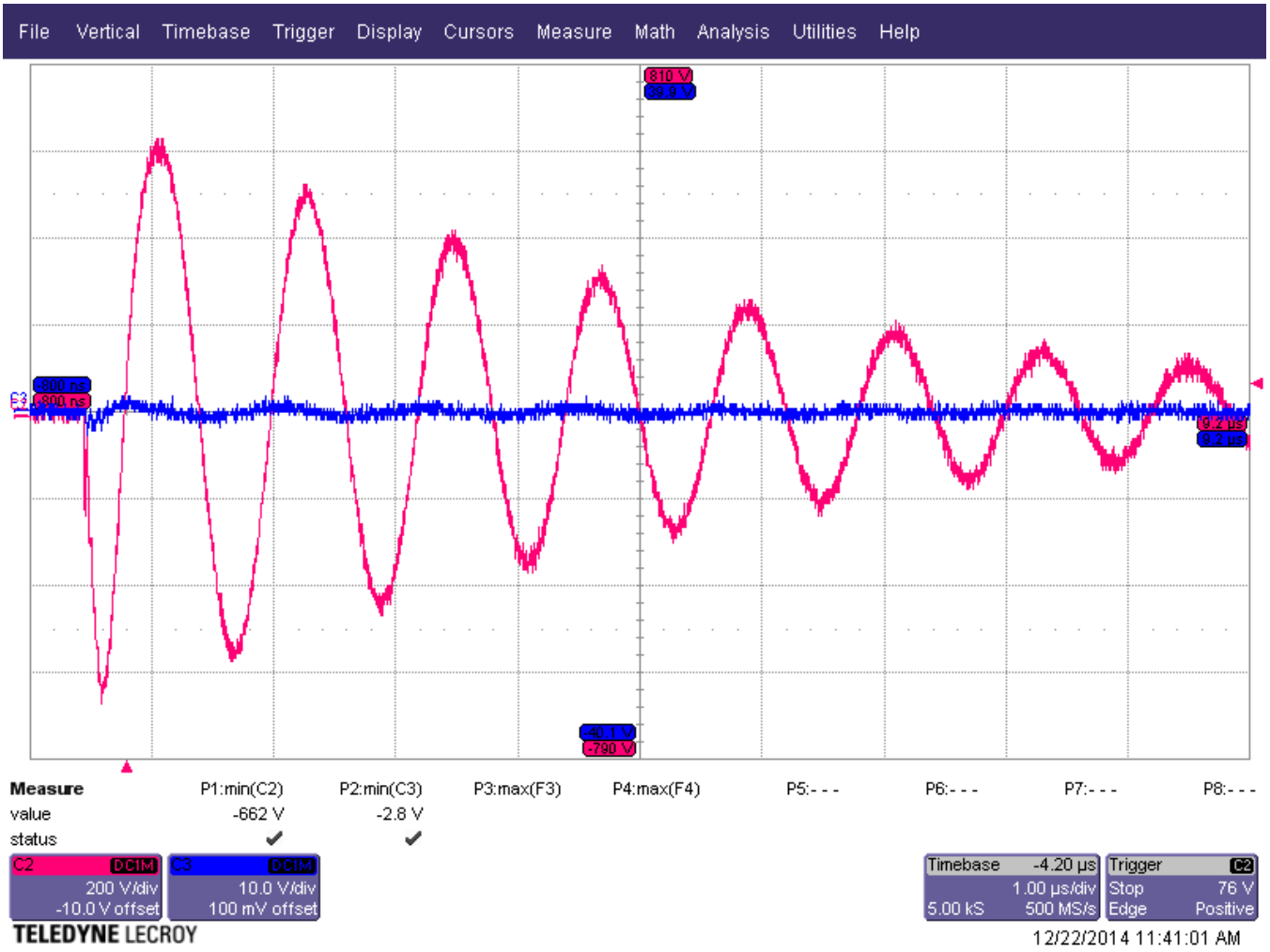
WF3 & WF 4 SN 1

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 11:40:53 AM

Pin WF3 Test Neg - Chip 1 - Sense 1

DLS EMC & Product Safety Testing • Consulting

Holt Integrated Electronics
Board 1 - Chip #1
Pin Inj. WF3 (Direct Injection)
Level 3 - 600V/24A
Gen 670



Channel Status

		C2	C3
Vertical	V / Div	200 V	10.0 V
	Offset	-10.0 V	100 mV
	Coupling	DC1MΩ	DC1MΩ
	BW	Full	Full
	Probe	1.000e+3	100.000
	Sweeps	1 #	1 #

Acquisition Status

Time / Div	1.00 µs	Sampling Rate	500 MS/s

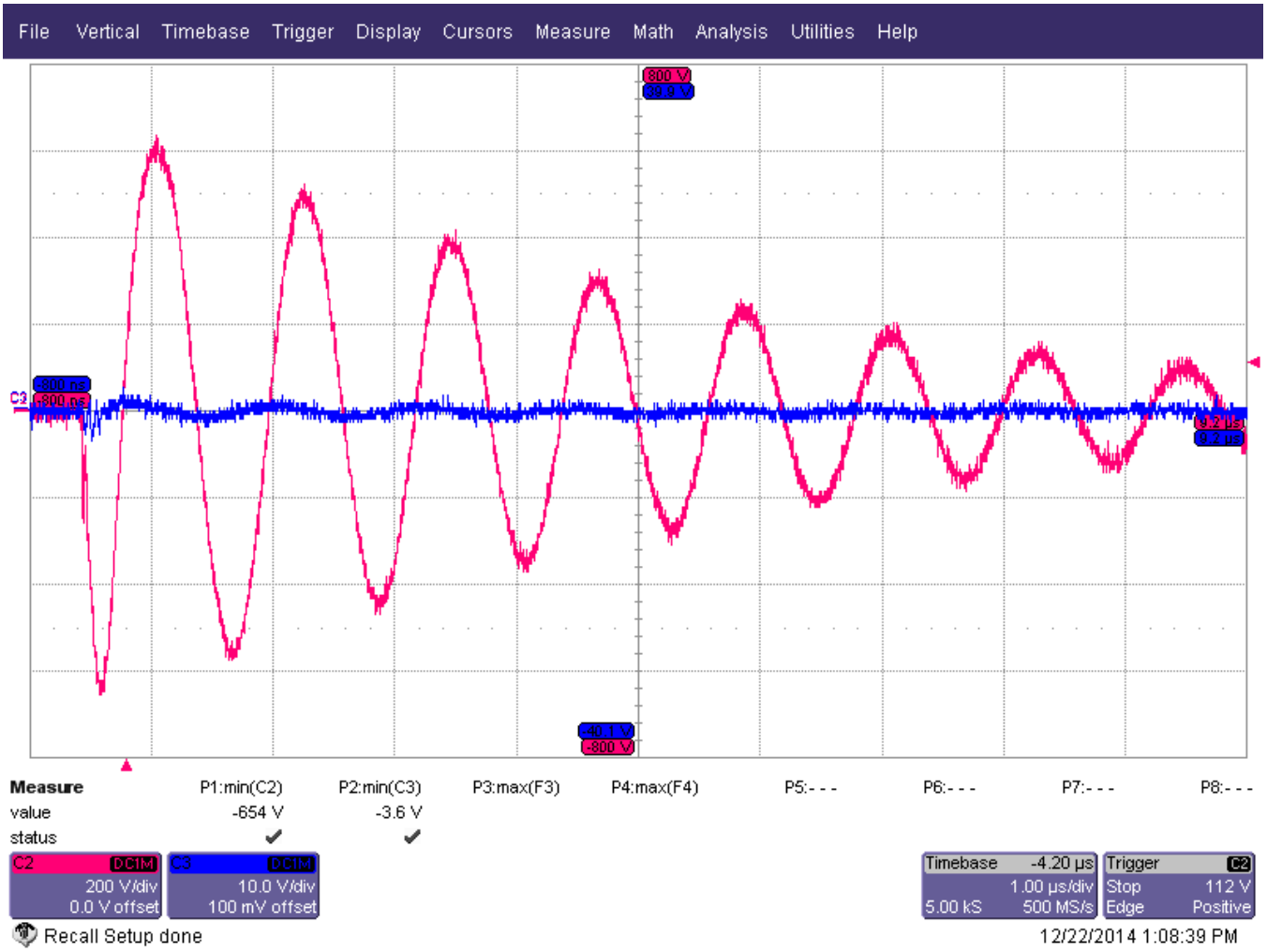
Horizontal	Time / Pt	2.000 ns	Sampling Mode	RealTime
	Pts / Div	500.0 S	Trigger Delay	-4.20 µs
Trigger	Mode	Stop	Slope	Positive
	Type	Edge	Level	76 V
	Source	C2	Coupling	DC

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 1:08:23 PM

Pin WF3 Test Neg - Chip 1 - Sense 2

DLS EMC & Product Safety Testing • Consulting

Holt Integrated Electronics
Board 1 - Chip #1
Pin Inj. WF3 (Direct Injection)
Level 3 - 600V/24A
Gen 670



Channel Status

		C2	C3
Vertical	V / Div	200 V	10.0 V
	Offset	0.0 V	100 mV
	Coupling	DC1MΩ	DC1MΩ
	BW	Full	Full
	Probe	1.000e+3	100.000
	Sweeps	1 #	1 #

Acquisition Status

Time / Div	1.00 µs	Sampling Rate	500 MS/s

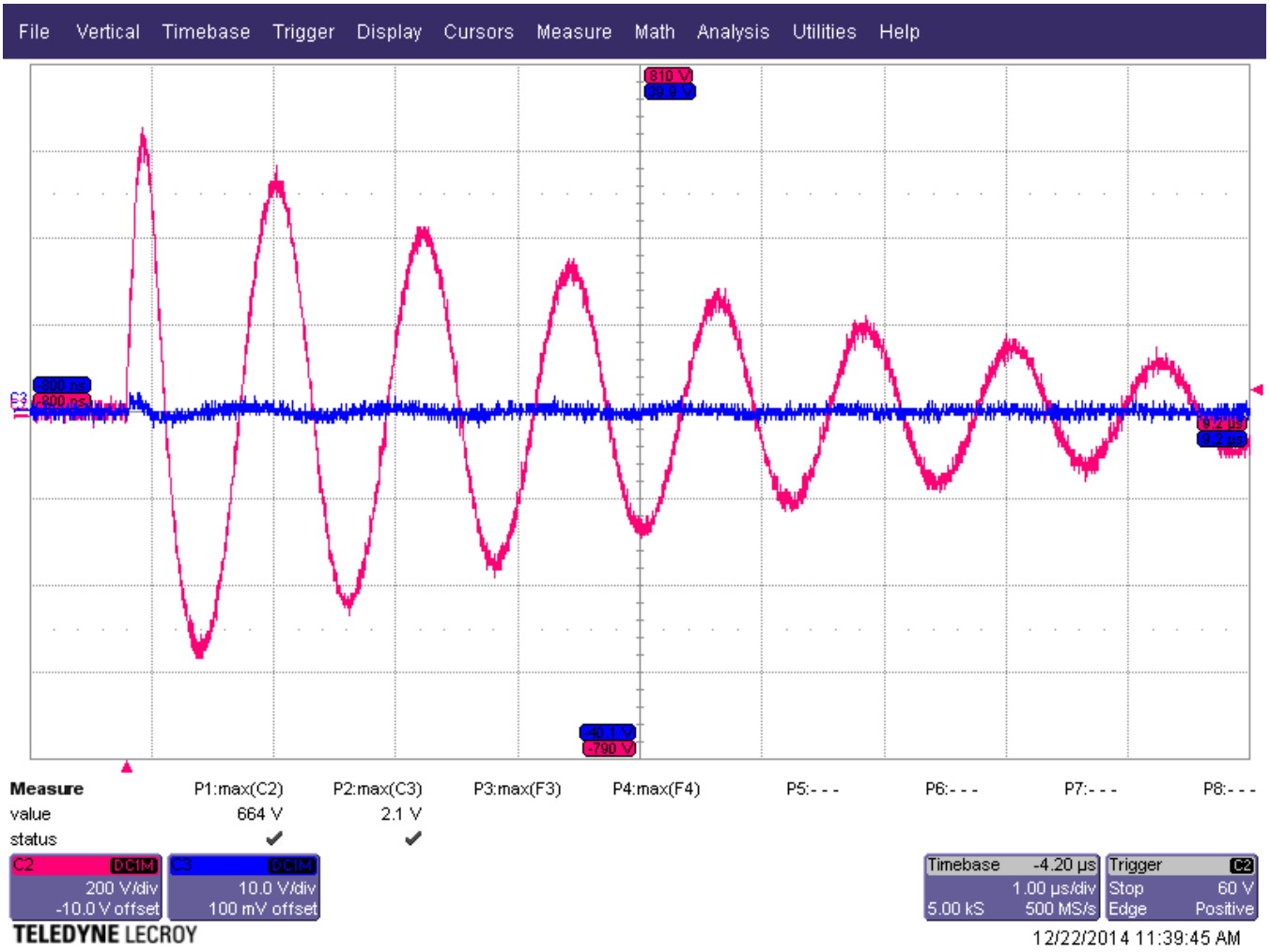
Horizontal	Time / Pt	2.000 ns	Sampling Mode	RealTime
	Pts / Div	500.0 S	Trigger Delay	-4.20 µs
Trigger	Mode	Stop	Slope	Positive
	Type	Edge	Level	112 V
	Source	C2	Coupling	DC

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 11:39:37 AM

Pin WF3 Test Pos - Chip 1 - Sense 1

DLS EMC & Product Safety Testing • Consulting

Holt Integrated Electronics
Board 1 - Chip #1
Pin Inj. WF3 (Direct Injection)
Level 3 - 600V/24A
Gen 670



Channel Status

		C2	C3
Vertical	V / Div	200 V	10.0 V
	Offset	-10.0 V	100 mV
	Coupling	DC1MΩ	DC1MΩ
	BW	Full	Full
	Probe	1.000e+3	100.000
	Sweeps	1 #	1 #

Acquisition Status

Time / Div	1.00 µs	Sampling Rate	500 MS/s

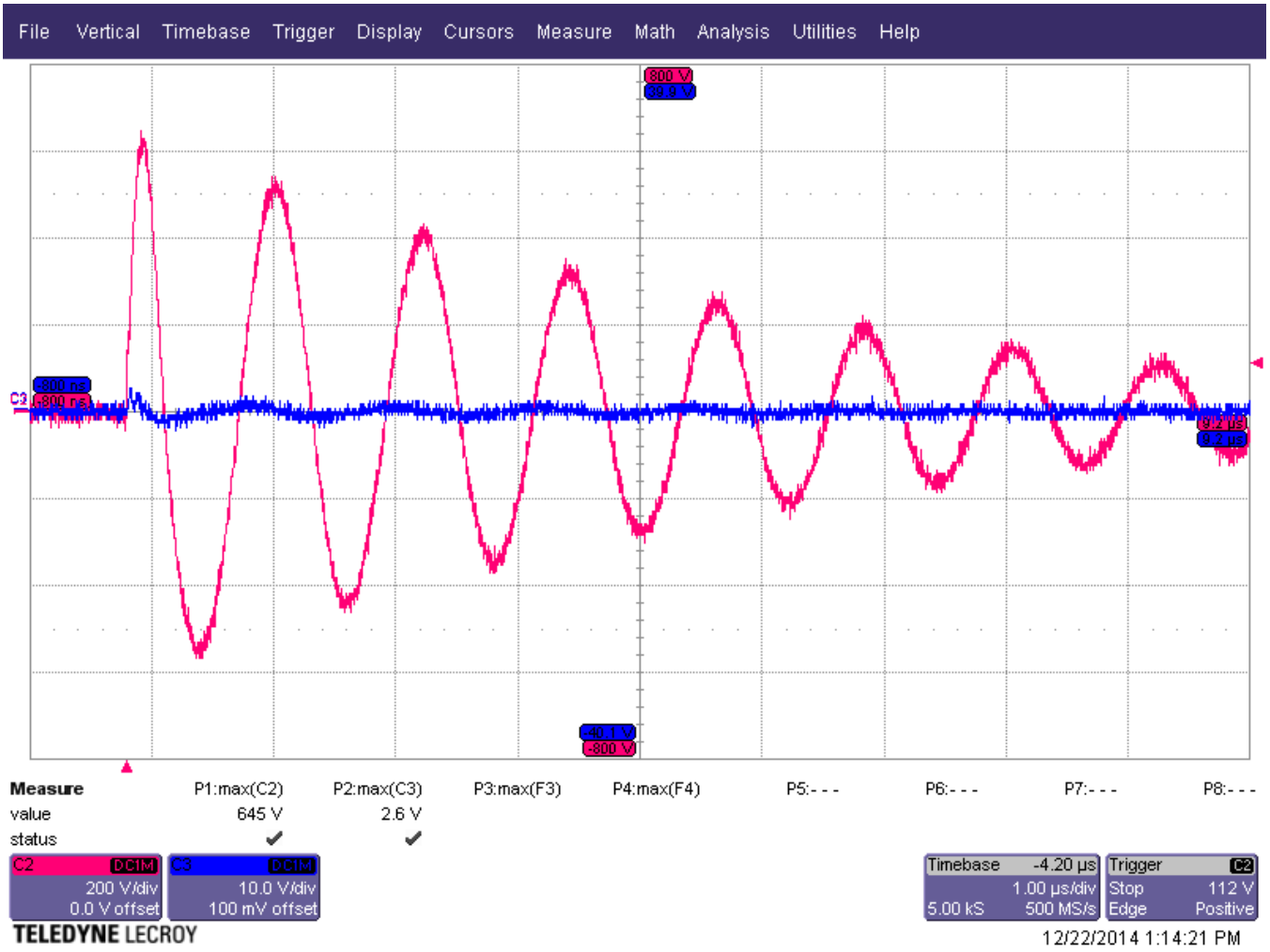
Horizontal	Time / Pt	2.000 ns	Sampling Mode	RealTime
	Pts / Div	500.0 S	Trigger Delay	-4.20 µs
Trigger	Mode	Stop	Slope	Positive
	Type	Edge	Level	60 V
	Source	C2	Coupling	DC

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 1:14:09 PM

Pin WF3 Test Pos - Chip 1 - Sense 2

DLS EMC & Product Safety Testing • Consulting

Holt Integrated Electronics
Board 1 - Chip #1
Pin Inj. WF3 (Direct Injection)
Level 3 - 600V/24A
Gen 670



Channel Status

		C2	C3
Vertical	V / Div	200 V	10.0 V
	Offset	0.0 V	100 mV
	Coupling	DC1MΩ	DC1MΩ
	BW	Full	Full
	Probe	1.000e+3	100.000
	Sweeps	1 #	1 #

Acquisition Status

Time / Div	1.00 µs	Sampling Rate	500 MS/s

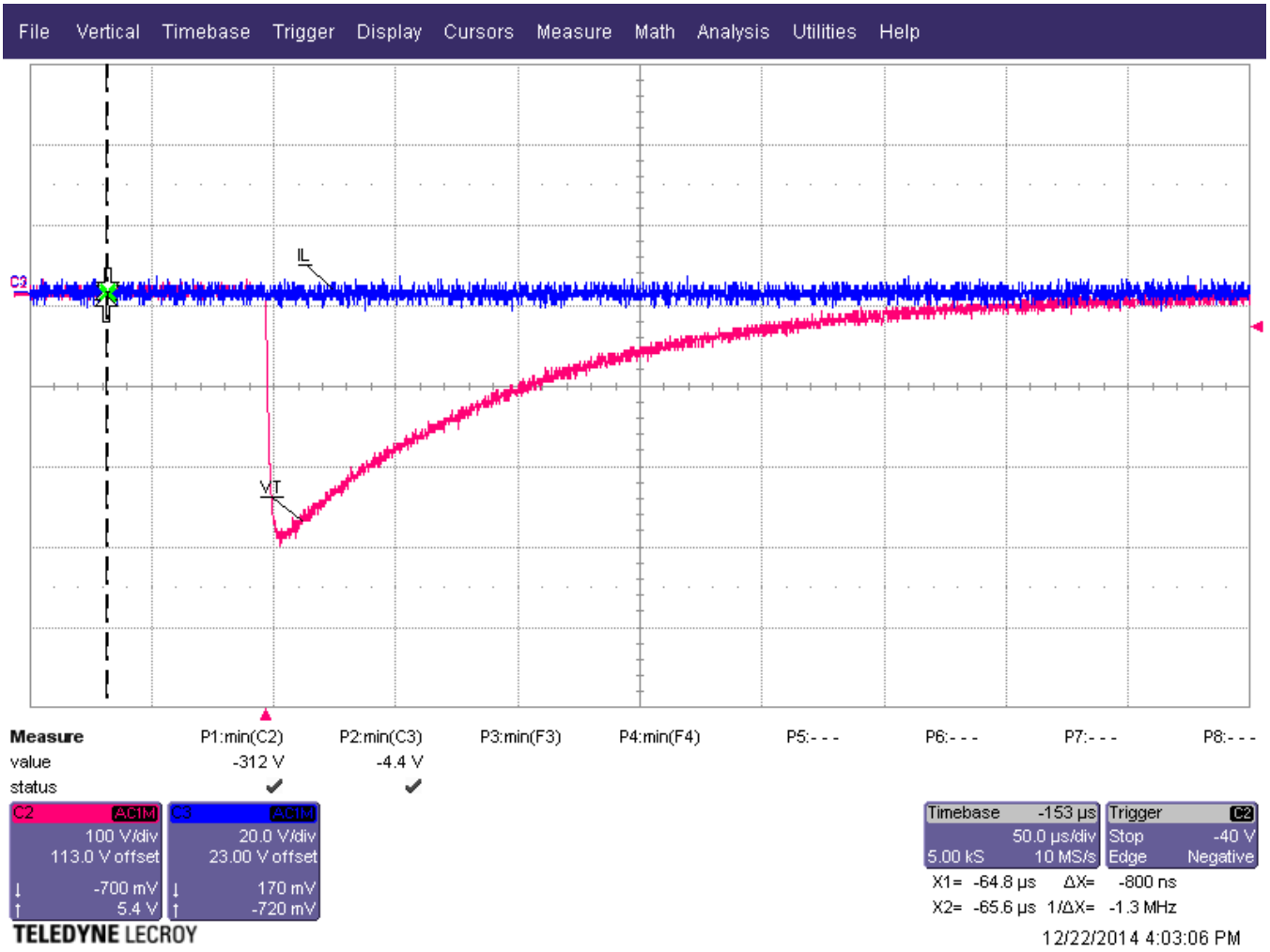
Horizontal	Time / Pt	2.000 ns	Sampling Mode	RealTime
	Pts / Div	500.0 S	Trigger Delay	-4.20 µs
Trigger	Mode	Stop	Slope	Positive
	Type	Edge	Level	112 V
	Source	C2	Coupling	DC

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 4:02:58 PM

Pin WF4 Test Neg - Chip SN1 - Sense 1

DLS EMC & Product Safety Testing • Consulting

Holt Integrated Electronics
Board 1 - Chip SN1
Pin Inj. WF4 (Direct Injection)
Level 3 - 300V/60A
Gen 300



Channel Status

		C2	C3
Vertical	V / Div	100 V	20.0 V
	Offset	113.0 V	23.00 V
	Coupling	AC1MΩ	AC1MΩ
	BW	Full	Full
	Probe	1.000e+3	100.000
	Sweeps	1 #	1 #

Acquisition Status

Time / Div	50.0 µs	Sampling Rate	10 MS/s

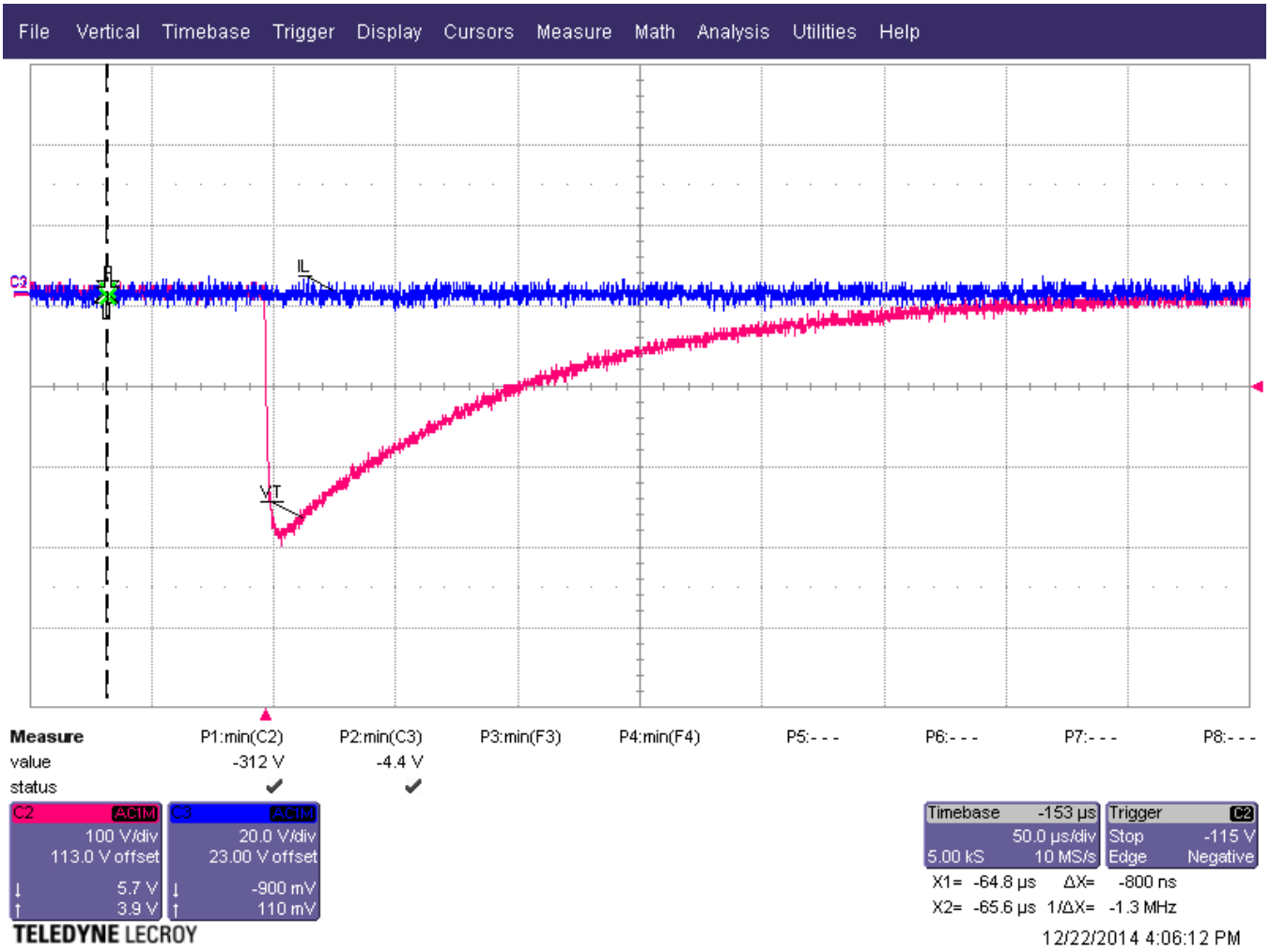
Horizontal	Time / Pt	100.000 ns	Sampling Mode	RealTime
	Pts / Div	500.0 S	Trigger Delay	-153 µs
Trigger	Mode	Stop	Slope	Negative
	Type	Edge	Level	-40 V
	Source	C2	Coupling	DC

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 4:06:02 PM

Pin WF4 Test Neg - Chip SN1 - Sense 2

DLS EMC & Product Safety Testing • Consulting

Holt Integrated Electronics
Board 1 - Chip SN1
Pin Inj. WF4 (Direct Injection)
Level 3 - 300V/60A
Gen 300



Channel Status

		C2	C3
Vertical	V / Div	100 V	20.0 V
	Offset	113.0 V	23.00 V
	Coupling	AC1MΩ	AC1MΩ
	BW	Full	Full
	Probe	1.000e+3	100.000
	Sweeps	1 #	1 #

Acquisition Status

Time / Div	50.0 µs	Sampling Rate	10 MS/s

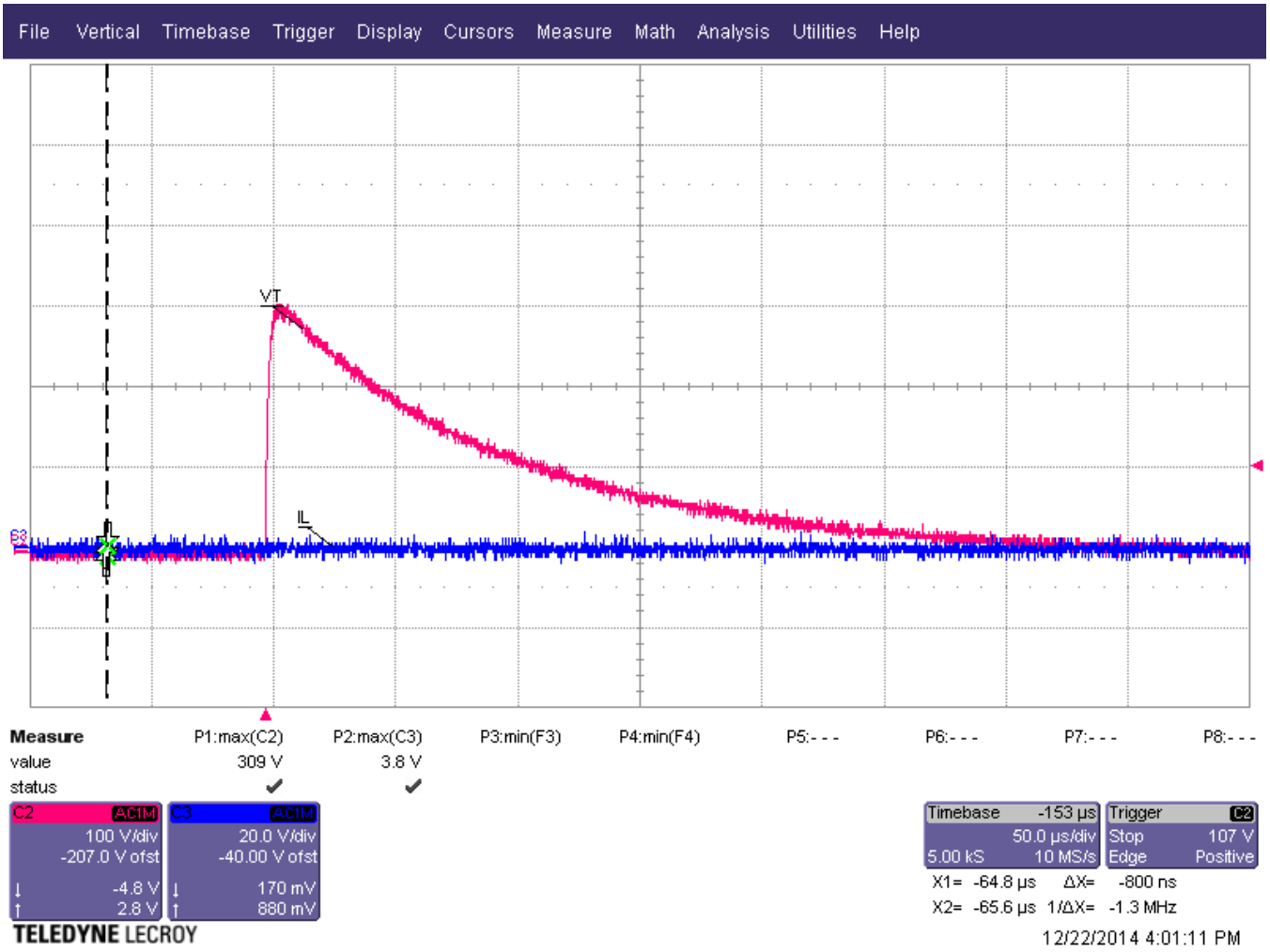
Horizontal	Time / Pt	100.000 ns	Sampling Mode	RealTime
	Pts / Div	500.0 S	Trigger Delay	-153 µs
Trigger	Mode	Stop	Slope	Negative
	Type	Edge	Level	-115 V
	Source	C2	Coupling	DC

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 4:00:59 PM

Pin WF4 Test Pos - Chip SN1 - Sense 1

DLS EMC & Product Safety Testing • Consulting

Holt Integrated Electronics
Board 1 - Chip SN1
Pin Inj. WF4 (Direct Injection)
Level 3 - 300V/60A
Gen 300



Channel Status

		C2	C3
Vertical	V / Div	100 V	20.0 V
	Offset	-207.0 V	-40.00 V
	Coupling	AC1MΩ	AC1MΩ
	BW	Full	Full
	Probe	1.000e+3	100.000
	Sweeps	1 #	1 #

Acquisition Status

Time / Div	50.0 µs	Sampling Rate	10 MS/s

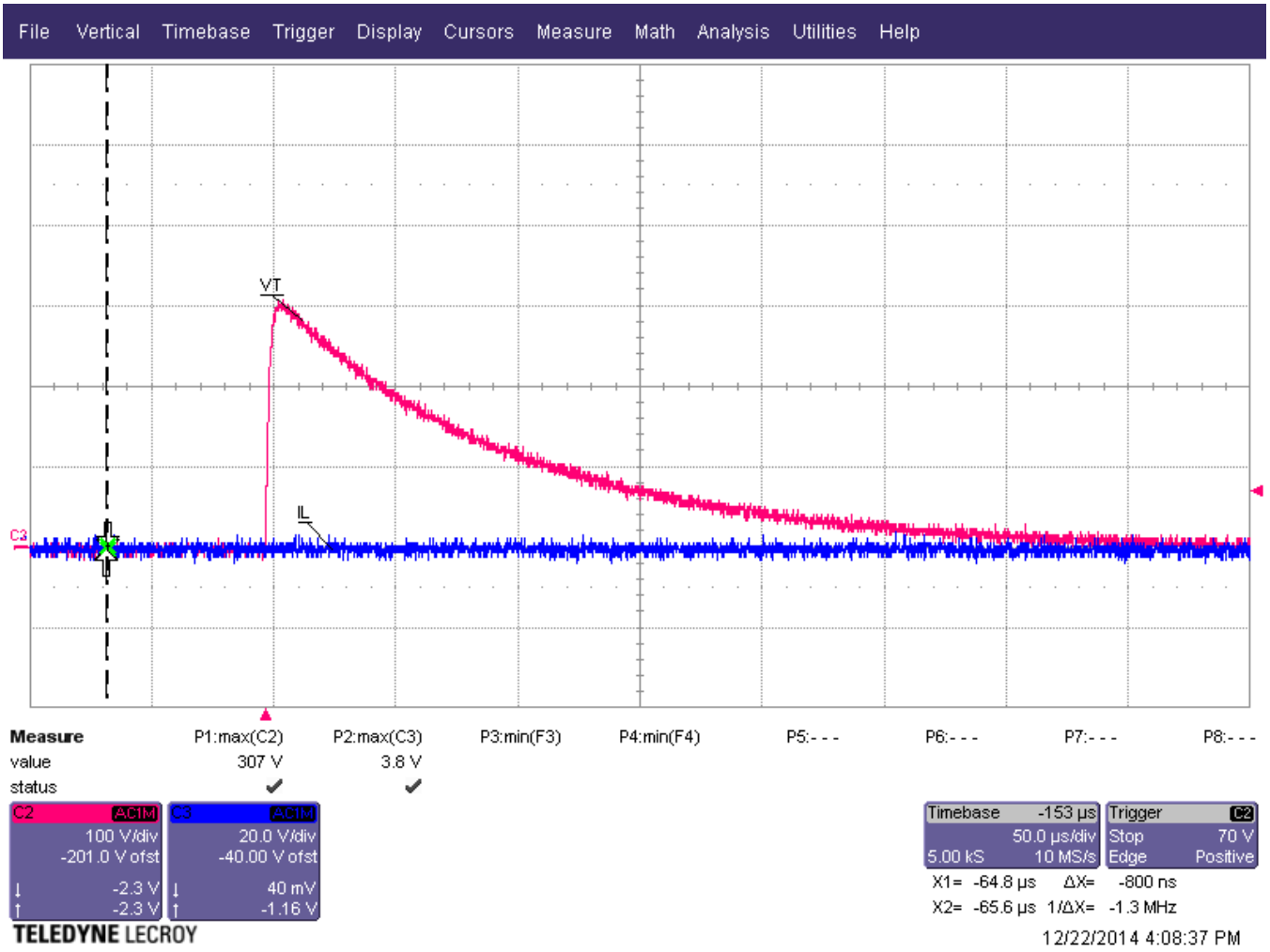
Horizontal	Time / Pt	100.000 ns	Sampling Mode	RealTime
	Pts / Div	500.0 S	Trigger Delay	-153 µs
Trigger	Mode	Stop	Slope	Positive
	Type	Edge	Level	107 V
	Source	C2	Coupling	DC

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 4:08:25 PM

Pin WF4 Test Pos - Chip SN1 - Sense 2

DLS EMC & Product Safety Testing • Consulting

Holt Integrated Electronics
Board 1 - Chip SN1
Pin Inj. WF4 (Direct Injection)
Level 3 - 300V/60A
Gen 300



Channel Status

		C2	C3
Vertical	V / Div	100 V	20.0 V
	Offset	-201.0 V	-40.00 V
	Coupling	AC1MΩ	AC1MΩ
	BW	Full	Full
	Probe	1.000e+3	100.000
	Sweeps	1 #	1 #

Acquisition Status

Time / Div	50.0 µs	Sampling Rate	10 MS/s

Horizontal	Time / Pt	100.000 ns	Sampling Mode	RealTime
	Pts / Div	500.0 S	Trigger Delay	-153 µs
Trigger	Mode	Stop	Slope	Positive
	Type	Edge	Level	70 V
	Source	C2	Coupling	DC

SECTION 22

PIN INJECTION TEST DATA SHEETS

WF3 & WF5B

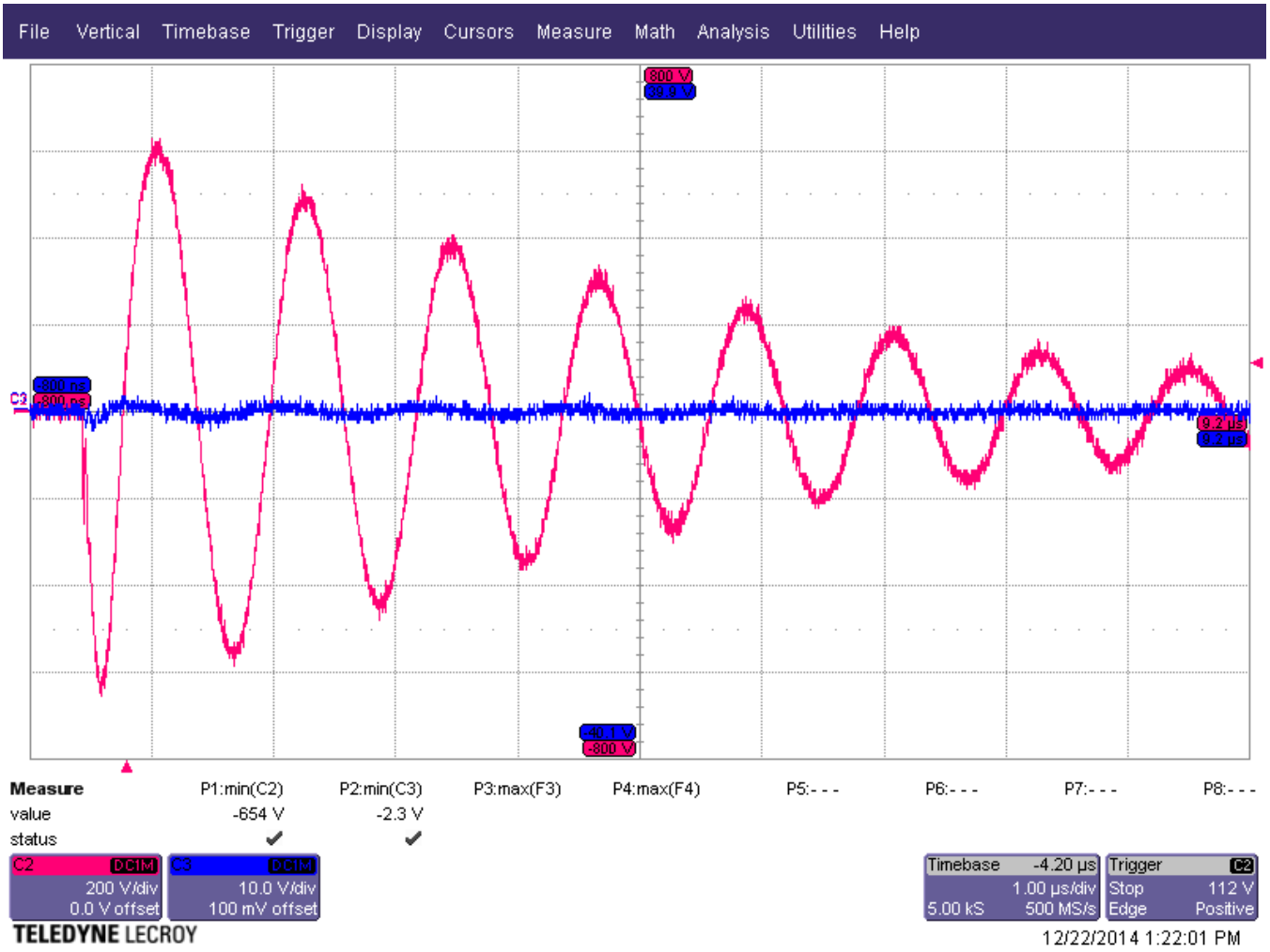
SN 2

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 1:21:50 PM

Pin WF3 Test Neg - Chip SN2 - Sense 1

DLS EMC & Product Safety Testing • Consulting

Holt Integrated Electronics
Board 1 - Chip SN2
Pin Inj. WF3 (Direct Injection)
Level 3 - 600V/24A
Gen 670



Channel Status

		C2	C3
Vertical	V / Div	200 V	10.0 V
	Offset	0.0 V	100 mV
	Coupling	DC1MΩ	DC1MΩ
	BW	Full	Full
	Probe	1.000e+3	100.000
	Sweeps	1 #	1 #

Acquisition Status

Time / Div	1.00 µs	Sampling Rate	500 MS/s

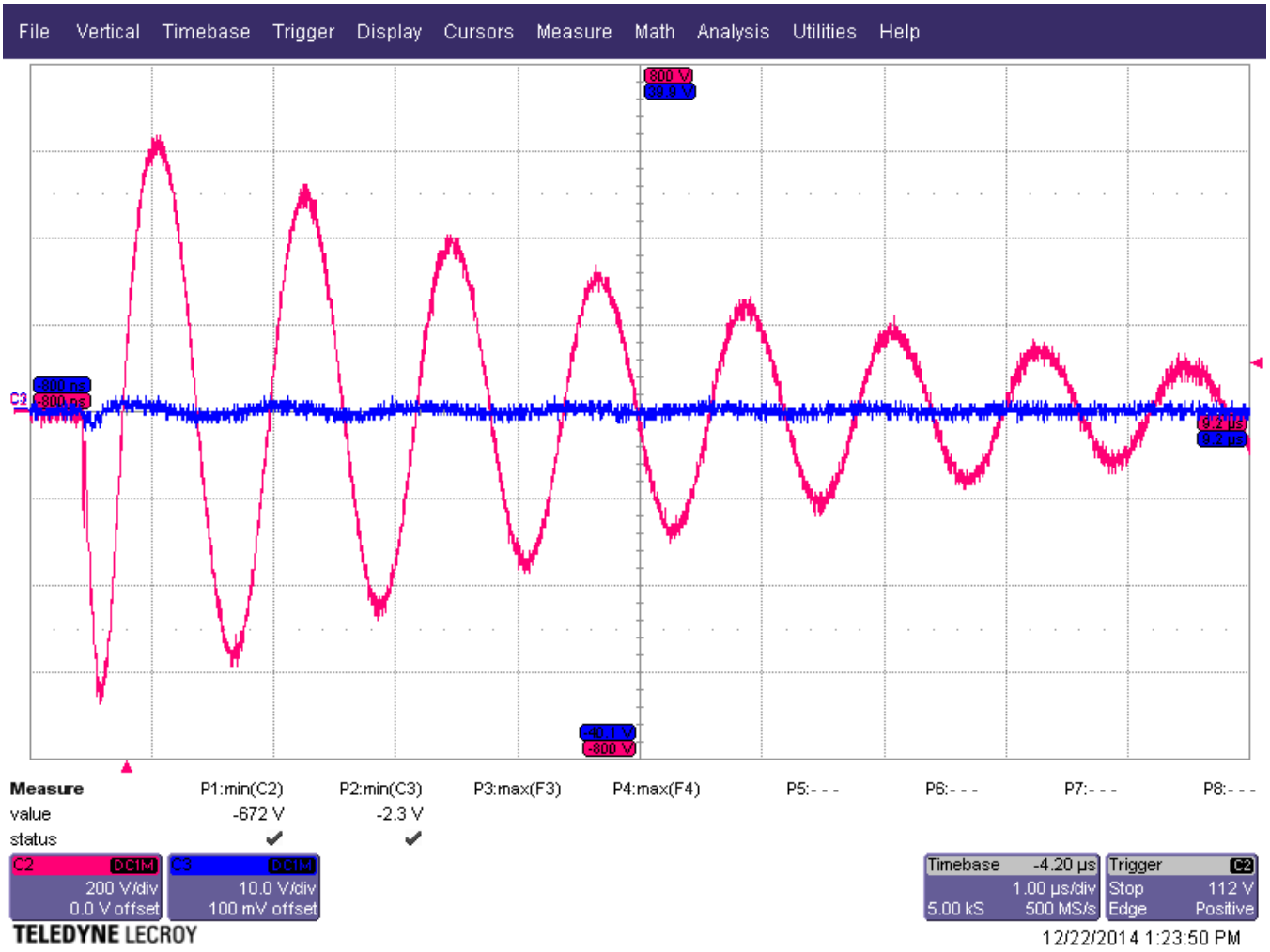
Horizontal	Time / Pt	2.000 ns	Sampling Mode	RealTime
	Pts / Div	500.0 S	Trigger Delay	-4.20 µs
Trigger	Mode	Stop	Slope	Positive
	Type	Edge	Level	112 V
	Source	C2	Coupling	DC

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 1:23:41 PM

Pin WF3 Test Neg - Chip SN2 - Sense 2

DLS EMC & Product Safety Testing • Consulting

Holt Integrated Electronics
Board 1 - Chip SN2
Pin Inj. WF3 (Direct Injection)
Level 3 - 600V/24A
Gen 670



Channel Status

		C2	C3
Vertical	V / Div	200 V	10.0 V
	Offset	0.0 V	100 mV
	Coupling	DC1MΩ	DC1MΩ
	BW	Full	Full
	Probe	1.000e+3	100.000
	Sweeps	1 #	1 #

Acquisition Status

Time / Div	1.00 µs	Sampling Rate	500 MS/s

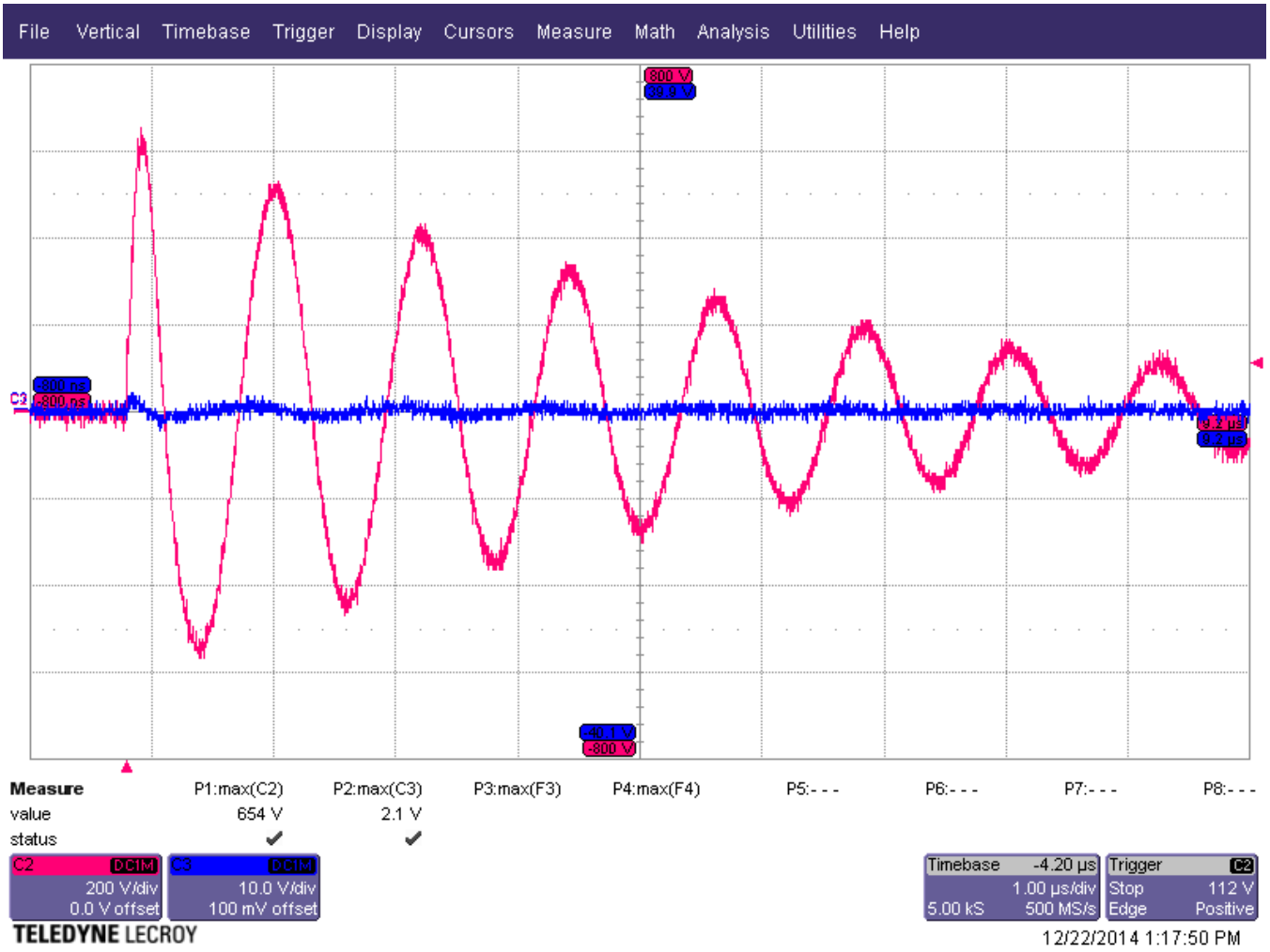
Horizontal	Time / Pt	2.000 ns	Sampling Mode	RealTime
	Pts / Div	500.0 S	Trigger Delay	-4.20 µs
Trigger	Mode	Stop	Slope	Positive
	Type	Edge	Level	112 V
	Source	C2	Coupling	DC

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 1:17:31 PM

Pin WF3 Test Pos - Chip SN2 - Sense 1

DLS EMC & Product Safety Testing • Consulting

Holt Integrated Electronics
Board 1 - Chip SN2
Pin Inj. WF3 (Direct Injection)
Level 3 - 600V/24A
Gen 670



Channel Status

		C2	C3
Vertical	V / Div	200 V	10.0 V
	Offset	0.0 V	100 mV
	Coupling	DC1MΩ	DC1MΩ
	BW	Full	Full
	Probe	1.000e+3	100.000
	Sweeps	1 #	1 #

Acquisition Status

Time / Div	1.00 µs	Sampling Rate	500 MS/s

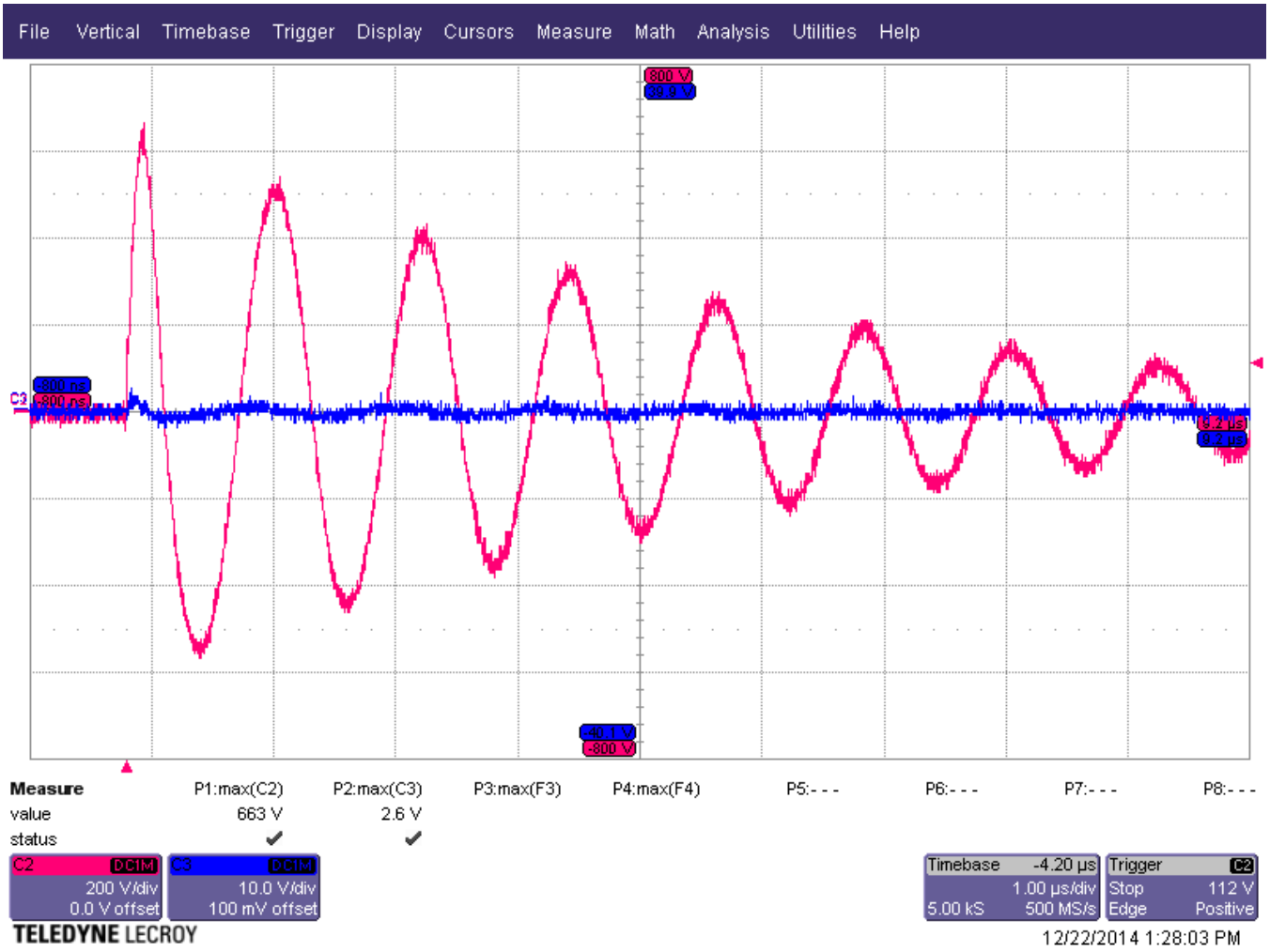
Horizontal	Time / Pt	2.000 ns	Sampling Mode	RealTime
	Pts / Div	500.0 S	Trigger Delay	-4.20 µs
Trigger	Mode	Stop	Slope	Positive
	Type	Edge	Level	112 V
	Source	C2	Coupling	DC

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 1:27:53 PM

Pin WF3 Test Pos - Chip SN2 - Sense 2

DLS EMC & Product Safety Testing • Consulting

Holt Integrated Electronics
Board 1 - Chip SN2
Pin Inj. WF3 (Direct Injection)
Level 3 - 600V/24A
Gen 670



Channel Status

		C2	C3
Vertical	V / Div	200 V	10.0 V
	Offset	0.0 V	100 mV
	Coupling	DC1MΩ	DC1MΩ
	BW	Full	Full
	Probe	1.000e+3	100.000
	Sweeps	1 #	1 #

Acquisition Status

Time / Div	1.00 µs	Sampling Rate	500 MS/s

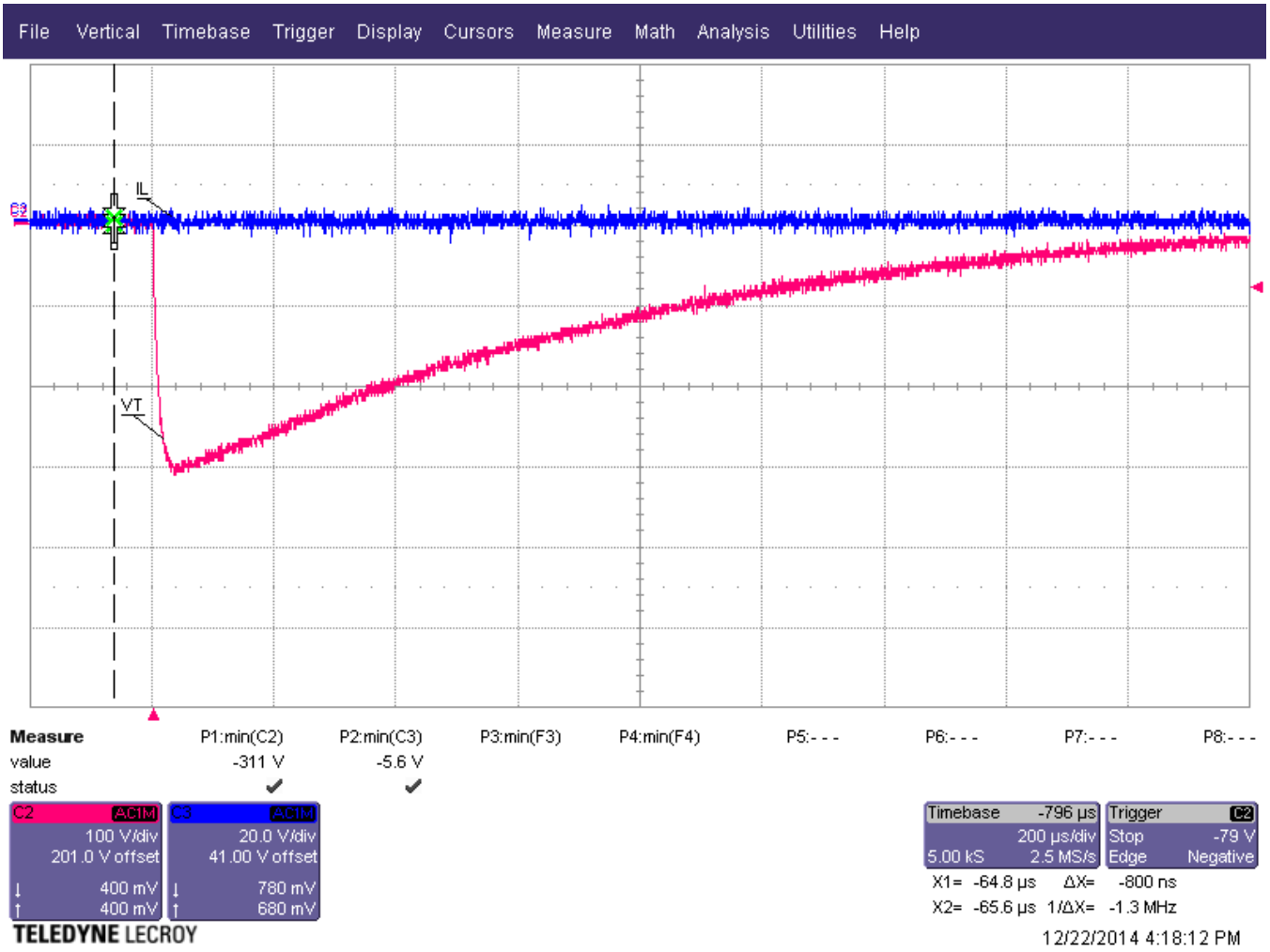
Horizontal	Time / Pt	2.000 ns	Sampling Mode	RealTime
	Pts / Div	500.0 S	Trigger Delay	-4.20 µs
Trigger	Mode	Stop	Slope	Positive
	Type	Edge	Level	112 V
	Source	C2	Coupling	DC

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 4:17:58 PM

Pin WF5B Test Neg - Chip SN2 - Sense 1

DLS EMC & Product Safety Testing • Consulting

Holt Integrated Electronics
Board 1 - Chip SN2
Pin Inj. WF5B (Direct Injection)
Level 3 - 300V/300A
Gen 300



Channel Status

		C2	C3
Vertical	V / Div	100 V	20.0 V
	Offset	201.0 V	41.00 V
	Coupling	AC1MΩ	AC1MΩ
	BW	Full	Full
	Probe	1.000e+3	100.000
	Sweeps	1 #	1 #

Acquisition Status

Time / Div	200 µs	Sampling Rate	2.5 MS/s

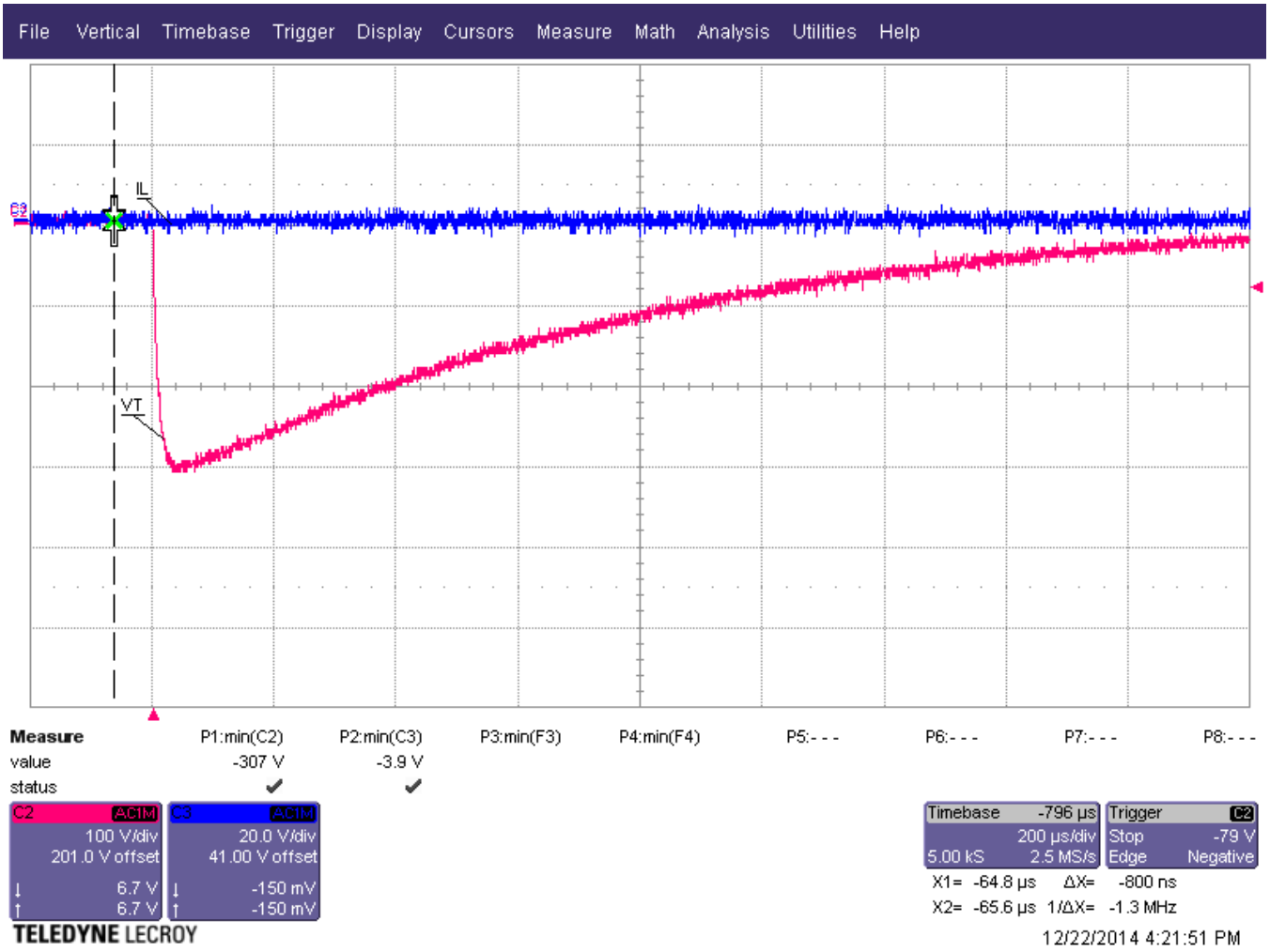
Horizontal	Time / Pt	400.000 ns	Sampling Mode	RealTime
	Pts / Div	500.0 S	Trigger Delay	-796 µs
Trigger	Mode	Stop	Slope	Negative
	Type	Edge	Level	-79 V
	Source	C2	Coupling	DC

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 4:21:40 PM

Pin WF5B Test Neg - Chip SN2 - Sense 2

DLS EMC & Product Safety Testing • Consulting

Holt Integrated Electronics
Board 1 - Chip SN2
Pin Inj. WF5B (Direct Injection)
Level 3 - 300V/300A
Gen 300



Channel Status

		C2	C3
Vertical	V / Div	100 V	20.0 V
	Offset	201.0 V	41.00 V
	Coupling	AC1MΩ	AC1MΩ
	BW	Full	Full
	Probe	1.000e+3	100.000
	Sweeps	1 #	1 #

Acquisition Status

Time / Div	200 µs	Sampling Rate	2.5 MS/s

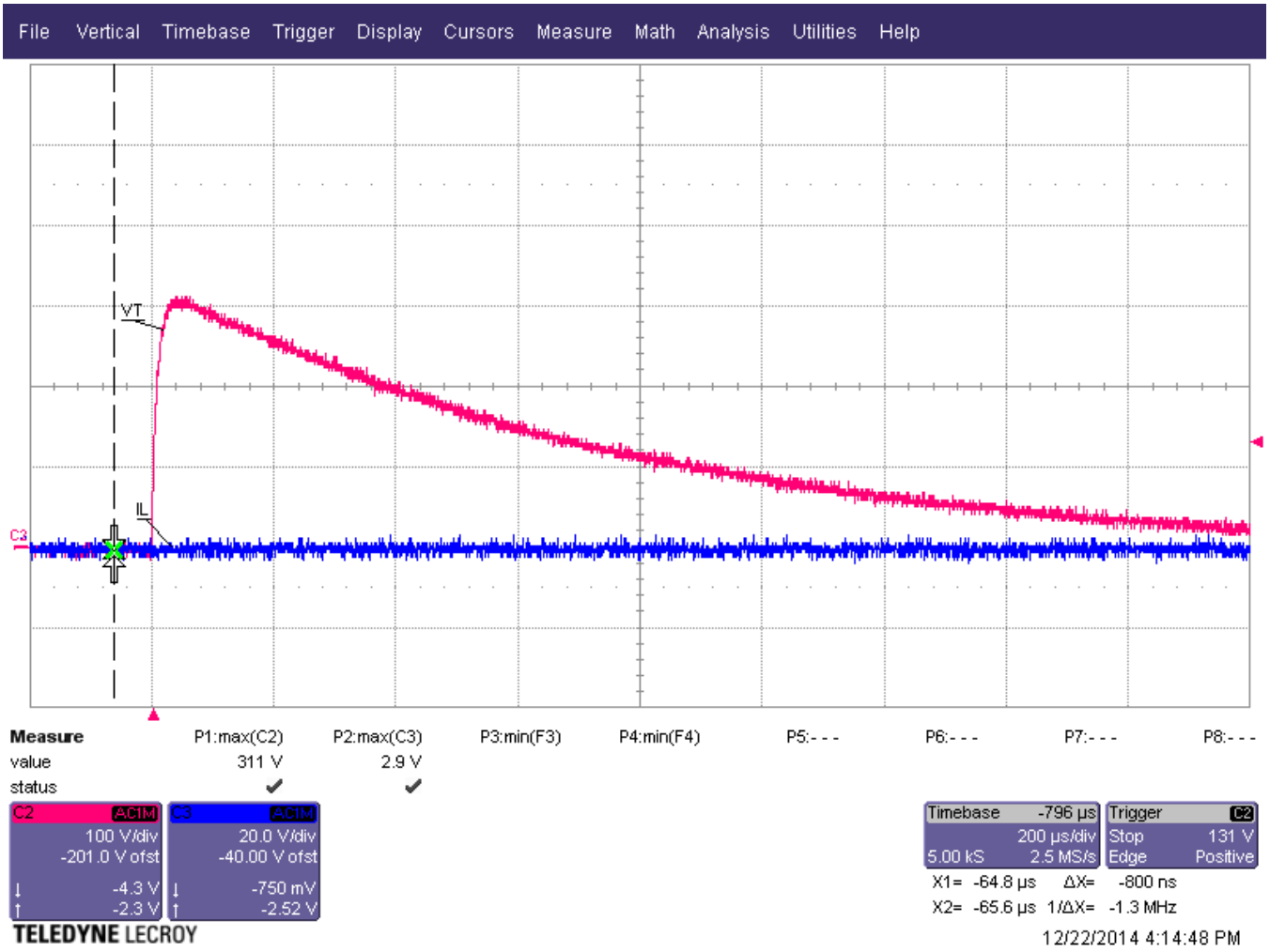
Horizontal	Time / Pt	400.000 ns	Sampling Mode	RealTime
	Pts / Div	500.0 S	Trigger Delay	-796 µs
Trigger	Mode	Stop	Slope	Negative
	Type	Edge	Level	-79 V
	Source	C2	Coupling	DC

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 4:14:31 PM

Pin WF5B Test Pos - Chip SN2 - Sense 1

DLS EMC & Product Safety Testing • Consulting

Holt Integrated Electronics
Board 1 - Chip SN2
Pin Inj. WF5B (Direct Injection)
Level 3 - 300V/300A
Gen 300



Channel Status

		C2	C3
Vertical	V / Div	100 V	20.0 V
	Offset	-201.0 V	-40.00 V
	Coupling	AC1MΩ	AC1MΩ
	BW	Full	Full
	Probe	1.000e+3	100.000
	Sweeps	1 #	1 #

Acquisition Status

Time / Div	200 µs	Sampling Rate	2.5 MS/s

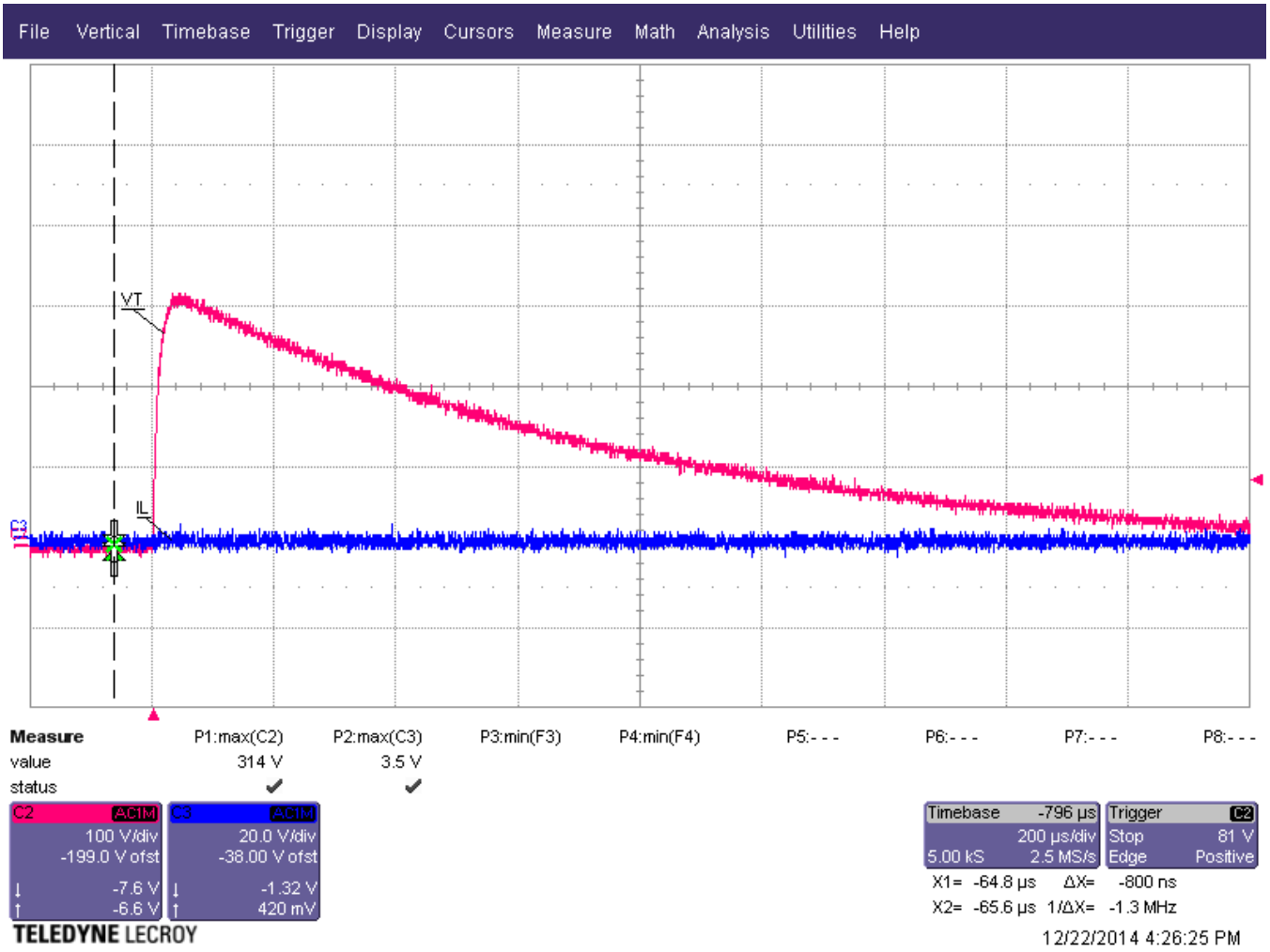
Horizontal	Time / Pt	400.000 ns	Sampling Mode	RealTime
	Pts / Div	500.0 S	Trigger Delay	-796 µs
Trigger	Mode	Stop	Slope	Positive
	Type	Edge	Level	131 V
	Source	C2	Coupling	DC

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 4:26:15 PM

Pin WF5B Test Pos - Chip SN2 - Sense 2

DLS EMC & Product Safety Testing • Consulting

Holt Integrated Electronics
Board 1 - Chip SN2
Pin Inj. WF5B (Direct Injection)
Level 3 - 300V/300A
Gen 300



Channel Status

		C2	C3
Vertical	V / Div	100 V	20.0 V
	Offset	-199.0 V	-38.00 V
	Coupling	AC1MΩ	AC1MΩ
	BW	Full	Full
	Probe	1.000e+3	100.000
	Sweeps	1 #	1 #

Acquisition Status

Time / Div	200 µs	Sampling Rate	2.5 MS/s

Horizontal	Time / Pt	400.000 ns	Sampling Mode	RealTime
	Pts / Div	500.0 S	Trigger Delay	-796 µs
Trigger	Mode	Stop	Slope	Positive
	Type	Edge	Level	81 V
	Source	C2	Coupling	DC

SECTION 22

PIN INJECTION TEST DATA SHEETS

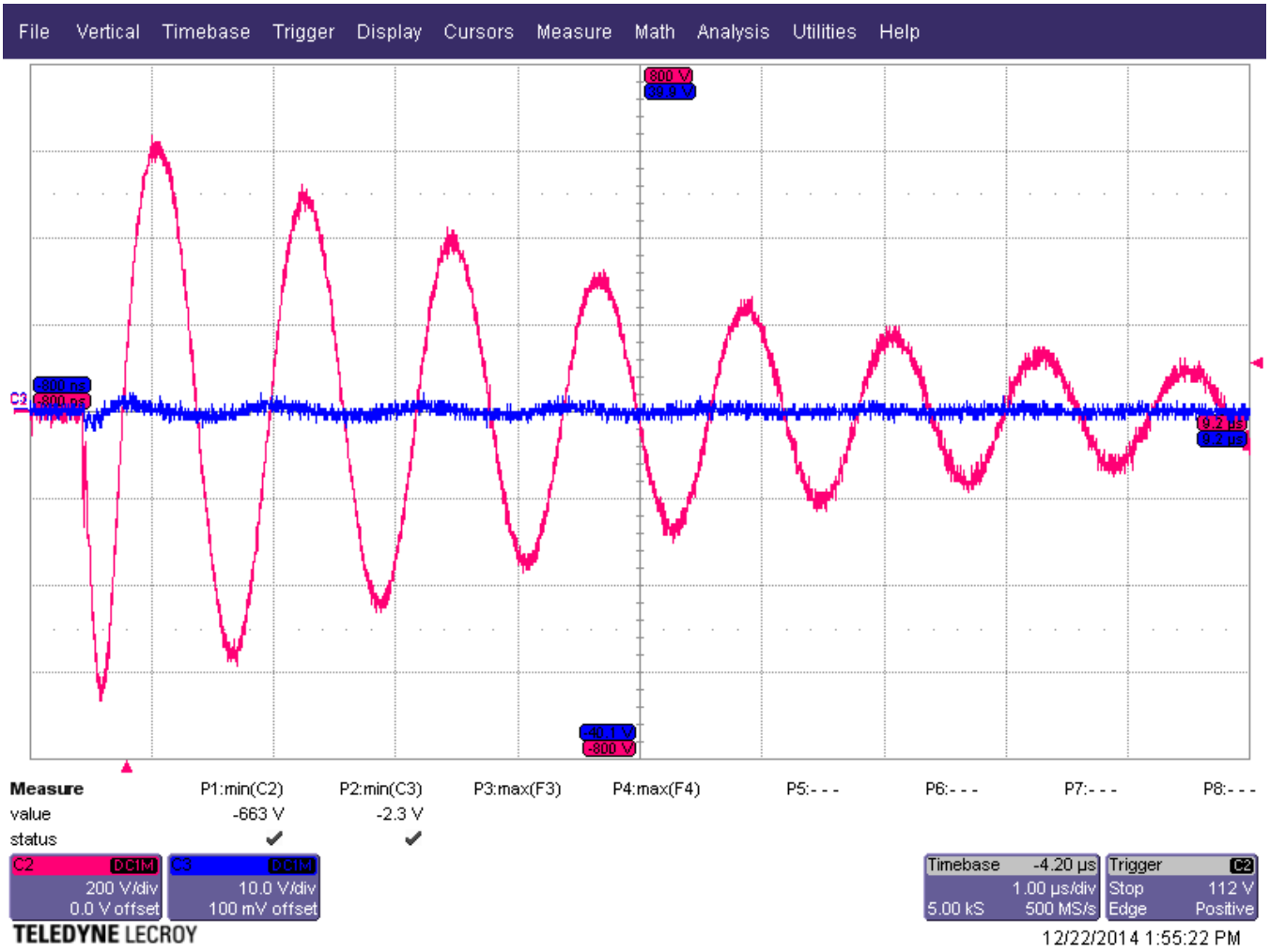
WF3 & WF5A SN3

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 1:55:11 PM

Pin WF3 Test Neg - Chip SN3 - Sense 1

DLS EMC & Product Safety Testing • Consulting

Holt Integrated Electronics
Board 2 - Chip SN3
Pin Inj. WF3 (Direct Injection)
Level 3 - 600V/24A
Gen 670



Channel Status

		C2	C3
Vertical	V / Div	200 V	10.0 V
	Offset	0.0 V	100 mV
	Coupling	DC1MΩ	DC1MΩ
	BW	Full	Full
	Probe	1.000e+3	100.000
	Sweeps	1 #	1 #

Acquisition Status

Time / Div	1.00 µs	Sampling Rate	500 MS/s

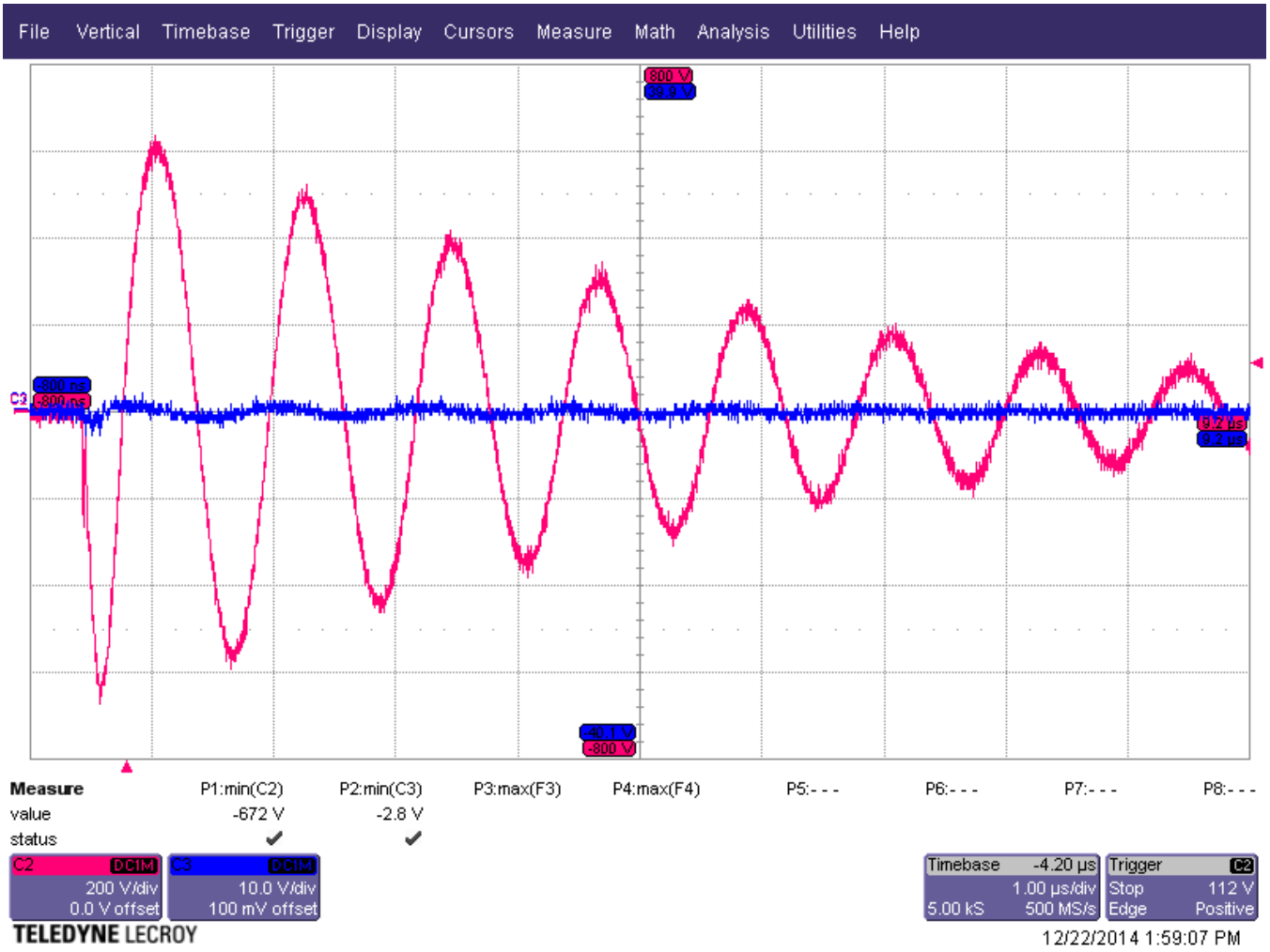
Horizontal	Time / Pt	2.000 ns	Sampling Mode	RealTime
	Pts / Div	500.0 S	Trigger Delay	-4.20 µs
Trigger	Mode	Stop	Slope	Positive
	Type	Edge	Level	112 V
	Source	C2	Coupling	DC

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 1:58:55 PM

Pin WF3 Test Neg - Chip SN3 - Sense 2

DLS EMC & Product Safety Testing • Consulting

Holt Integrated Electronics
Board 2 - Chip SN3
Pin Inj. WF3 (Direct Injection)
Level 3 - 600V/24A
Gen 670



Channel Status

		C2	C3
Vertical	V / Div	200 V	10.0 V
	Offset	0.0 V	100 mV
	Coupling	DC1MΩ	DC1MΩ
	BW	Full	Full
	Probe	1.000e+3	100.000
	Sweeps	1 #	1 #

Acquisition Status

Time / Div	1.00 µs	Sampling Rate	500 MS/s

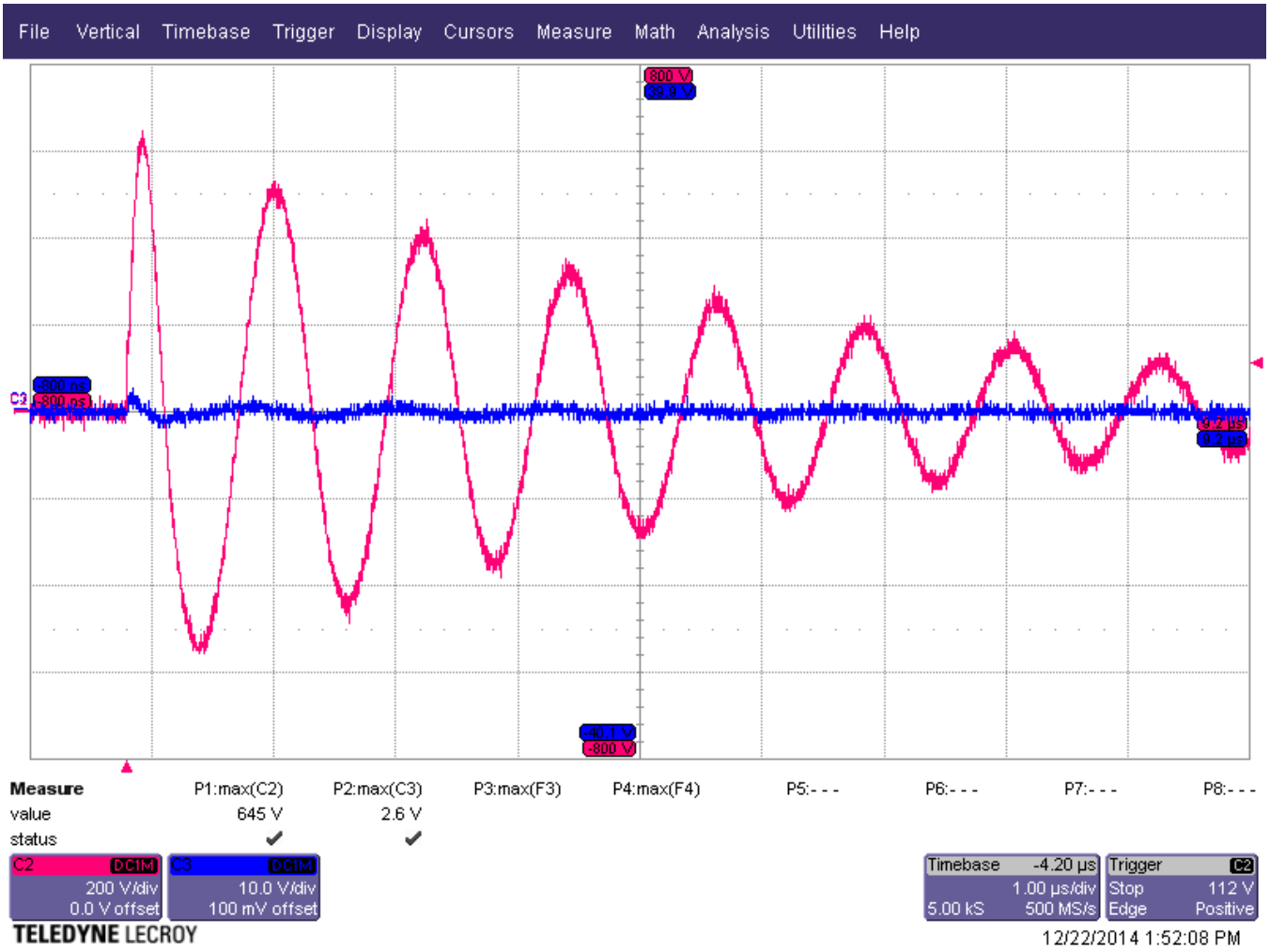
Horizontal	Time / Pt	2.000 ns	Sampling Mode	RealTime
	Pts / Div	500.0 S	Trigger Delay	-4.20 µs
Trigger	Mode	Stop	Slope	Positive
	Type	Edge	Level	112 V
	Source	C2	Coupling	DC

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 1:51:59 PM

Pin WF3 Test Pos - Chip SN3 - Sense 1

DLS EMC & Product Safety Testing • Consulting

Holt Integrated Electronics
Board 2 - Chip SN3
Pin Inj. WF3 (Direct Injection)
Level 3 - 600V/24A
Gen 670



Channel Status

		C2	C3
Vertical	V / Div	200 V	10.0 V
	Offset	0.0 V	100 mV
	Coupling	DC1MΩ	DC1MΩ
	BW	Full	Full
	Probe	1.000e+3	100.000
	Sweeps	1 #	1 #

Acquisition Status

Time / Div	1.00 µs	Sampling Rate	500 MS/s

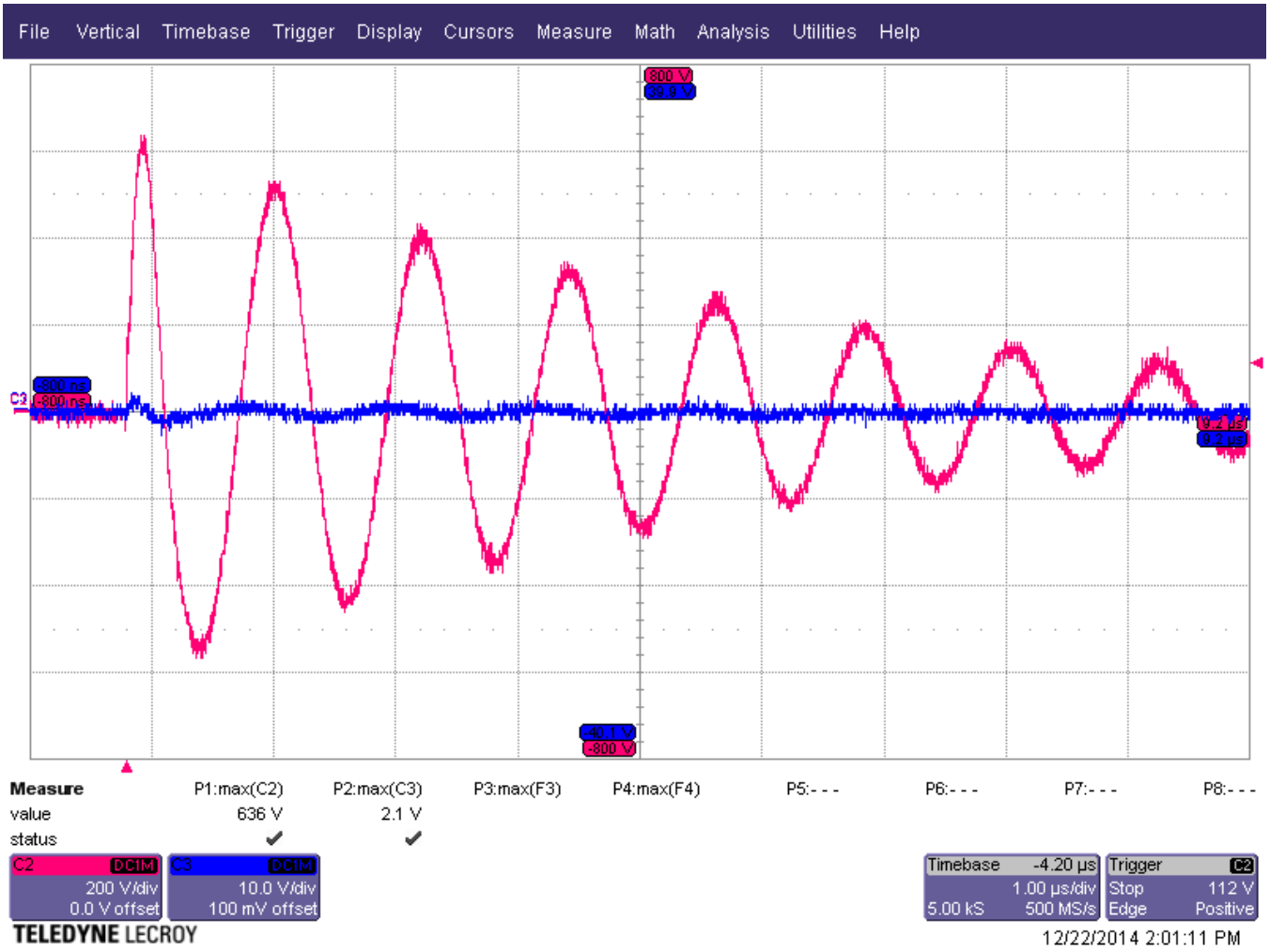
Horizontal	Time / Pt	2.000 ns	Sampling Mode	RealTime
	Pts / Div	500.0 S	Trigger Delay	-4.20 µs
Trigger	Mode	Stop	Slope	Positive
	Type	Edge	Level	112 V
	Source	C2	Coupling	DC

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 2:01:03 PM

Pin WF3 Test Pos - Chip SN3 - Sense 2

DLS EMC & Product Safety Testing • Consulting

Holt Integrated Electronics
Board 2 - Chip SN3
Pin Inj. WF3 (Direct Injection)
Level 3 - 600V/24A
Gen 670



Channel Status

		C2	C3
Vertical	V / Div	200 V	10.0 V
	Offset	0.0 V	100 mV
	Coupling	DC1MΩ	DC1MΩ
	BW	Full	Full
	Probe	1.000e+3	100.000
	Sweeps	1 #	1 #

Acquisition Status

Time / Div	1.00 µs	Sampling Rate	500 MS/s

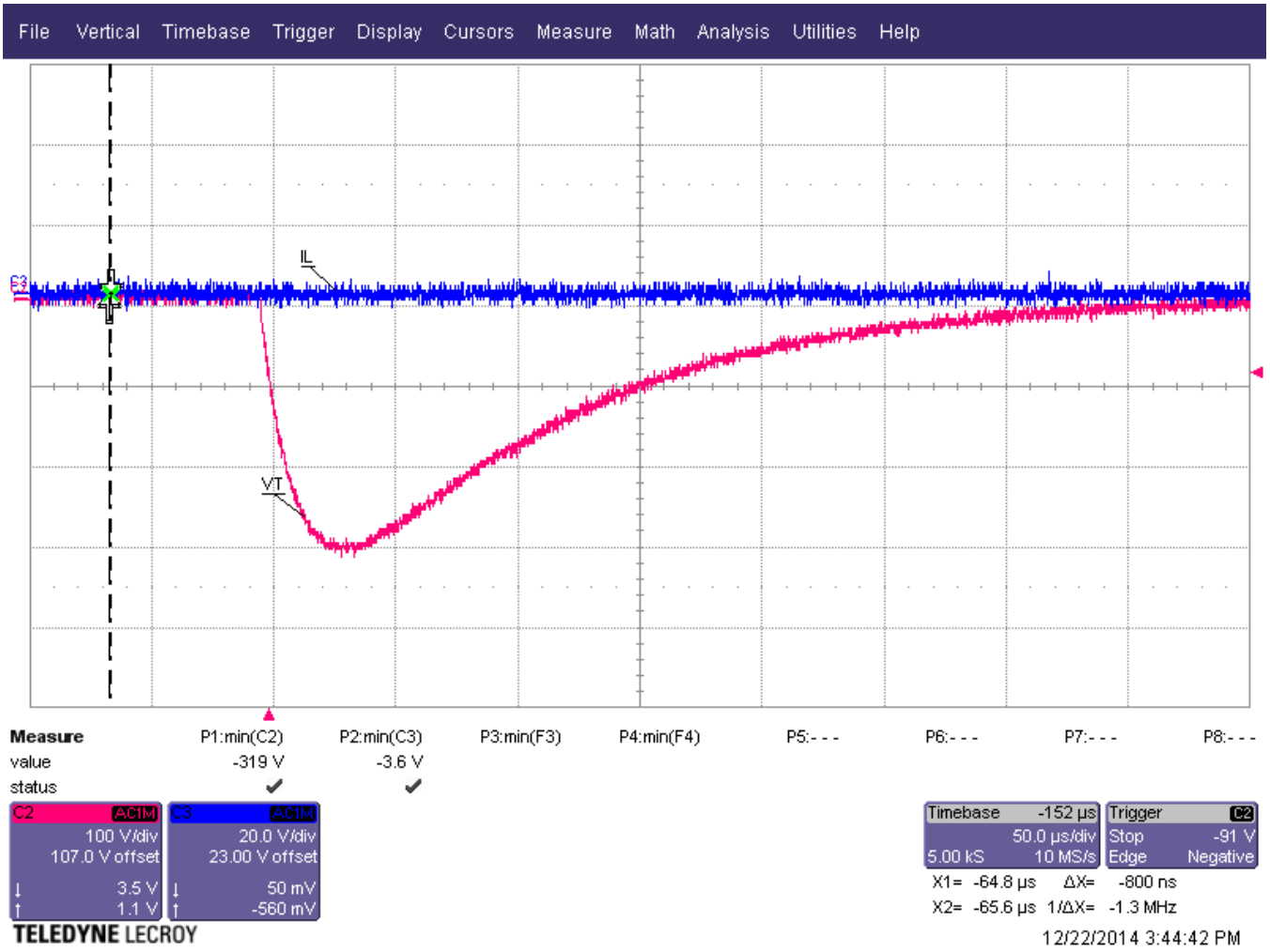
Horizontal	Time / Pt	2.000 ns	Sampling Mode	RealTime
	Pts / Div	500.0 S	Trigger Delay	-4.20 µs
Trigger	Mode	Stop	Slope	Positive
	Type	Edge	Level	112 V
	Source	C2	Coupling	DC

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 3:44:32 PM

Pin WF5a Test Neg - Chip SN3 - Sense 1

DLS EMC & Product Safety Testing • Consulting

Holt Integrated Electronics
Board 2 - Chip SN3
Pin Inj. WF5A (Direct Injection)
Level 3 - 300V/300A
Gen 300



Channel Status

		C2	C3
Vertical	V / Div	100 V	20.0 V
	Offset	107.0 V	23.00 V
	Coupling	AC1MΩ	AC1MΩ
	BW	Full	Full
	Probe	1.000e+3	100.000
	Sweeps	1 #	1 #

Acquisition Status

Time / Div	50.0 µs	Sampling Rate	10 MS/s

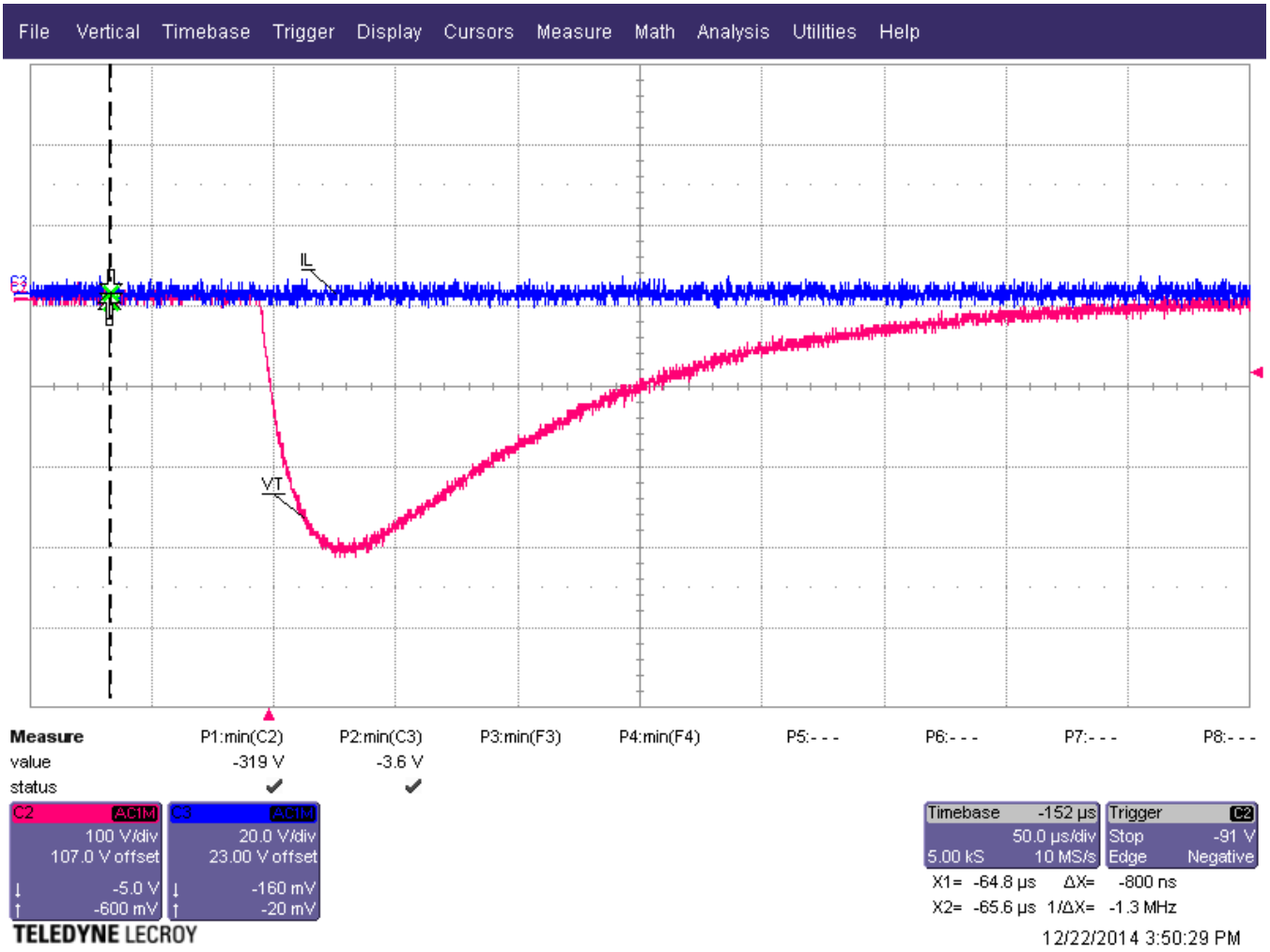
Horizontal	Time / Pt	100.000 ns	Sampling Mode	RealTime
	Pts / Div	500.0 S	Trigger Delay	-152 µs
Trigger	Mode	Stop	Slope	Negative
	Type	Edge	Level	-91 V
	Source	C2	Coupling	DC

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 3:50:19 PM

Pin WF5a Test Neg - Chip SN3 - Sense 2

DLS EMC & Product Safety Testing • Consulting

Holt Integrated Electronics
Board 2 - Chip SN3
Pin Inj. WF5A (Direct Injection)
Level 3 - 300V/300A
Gen 300



Channel Status

		C2	C3
Vertical	V / Div	100 V	20.0 V
	Offset	107.0 V	23.00 V
	Coupling	AC1MΩ	AC1MΩ
	BW	Full	Full
	Probe	1.000e+3	100.000
	Sweeps	1 #	1 #

Acquisition Status

Time / Div	50.0 µs	Sampling Rate	10 MS/s

Horizontal	Time / Pt	100.000 ns	Sampling Mode	RealTime
	Pts / Div	500.0 S	Trigger Delay	-152 µs
Trigger	Mode	Stop	Slope	Negative
	Type	Edge	Level	-91 V
	Source	C2	Coupling	DC

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 3:40:29 PM

Pin WF5a Test Pos - Chip SN3 - Sense 1

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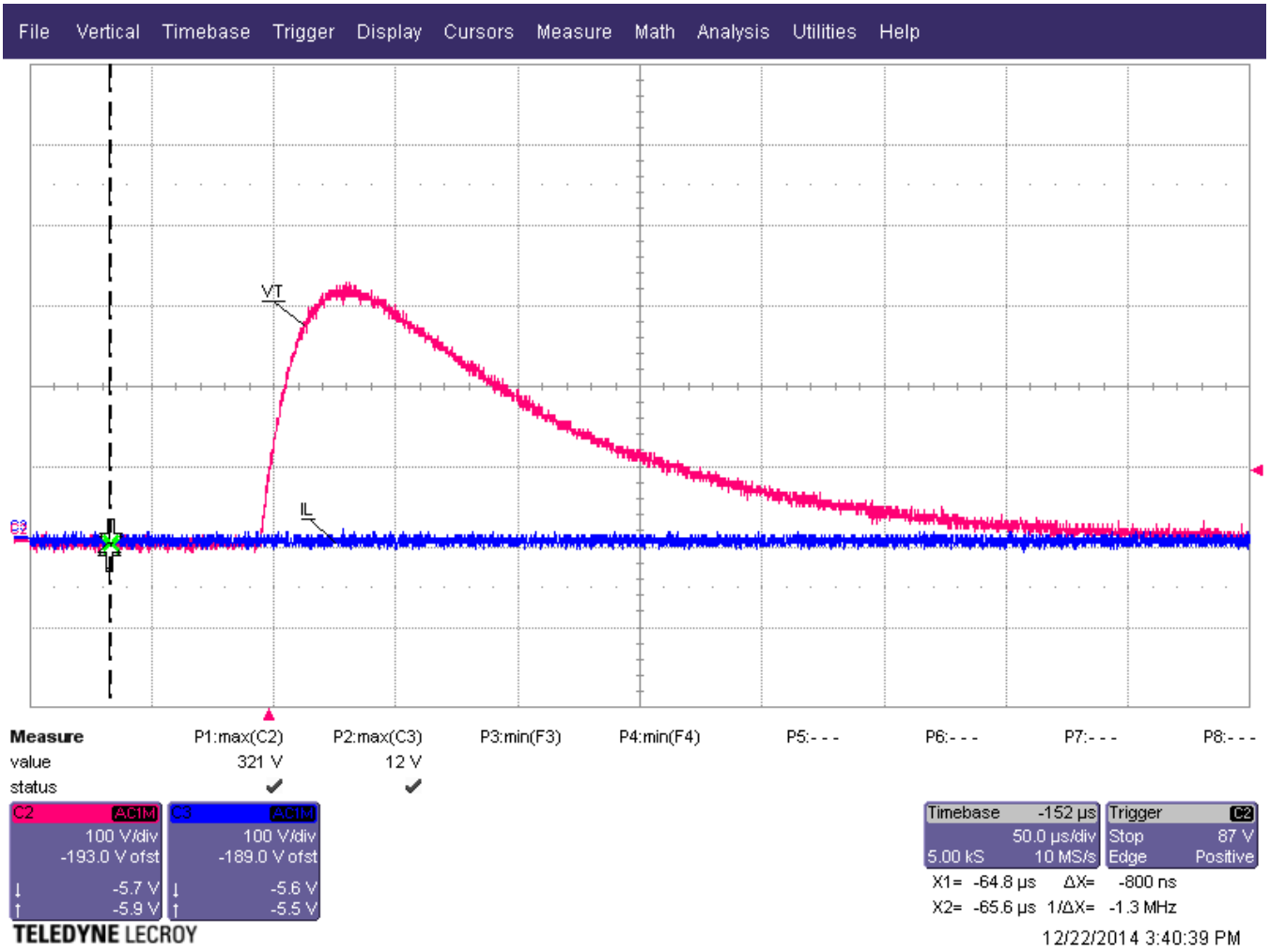
Holt Integrated Electronics
Board 2 - Chip SN3
Pin Inj. WF5A (Direct Injection)
Level 3 - 300V/300A
Gen 300



Channel Status

		C2	C3
Vertical	V / Div	100 V	100 V
	Offset	-193.0 V	-189.0 V
	Coupling	AC1MΩ	AC1MΩ
	BW	Full	Full
	Probe	1.000e+3	100.000
	Sweeps	1 #	1 #

Acquisition Status

Time / Div	50.0 µs	Sampling Rate	10 MS/s

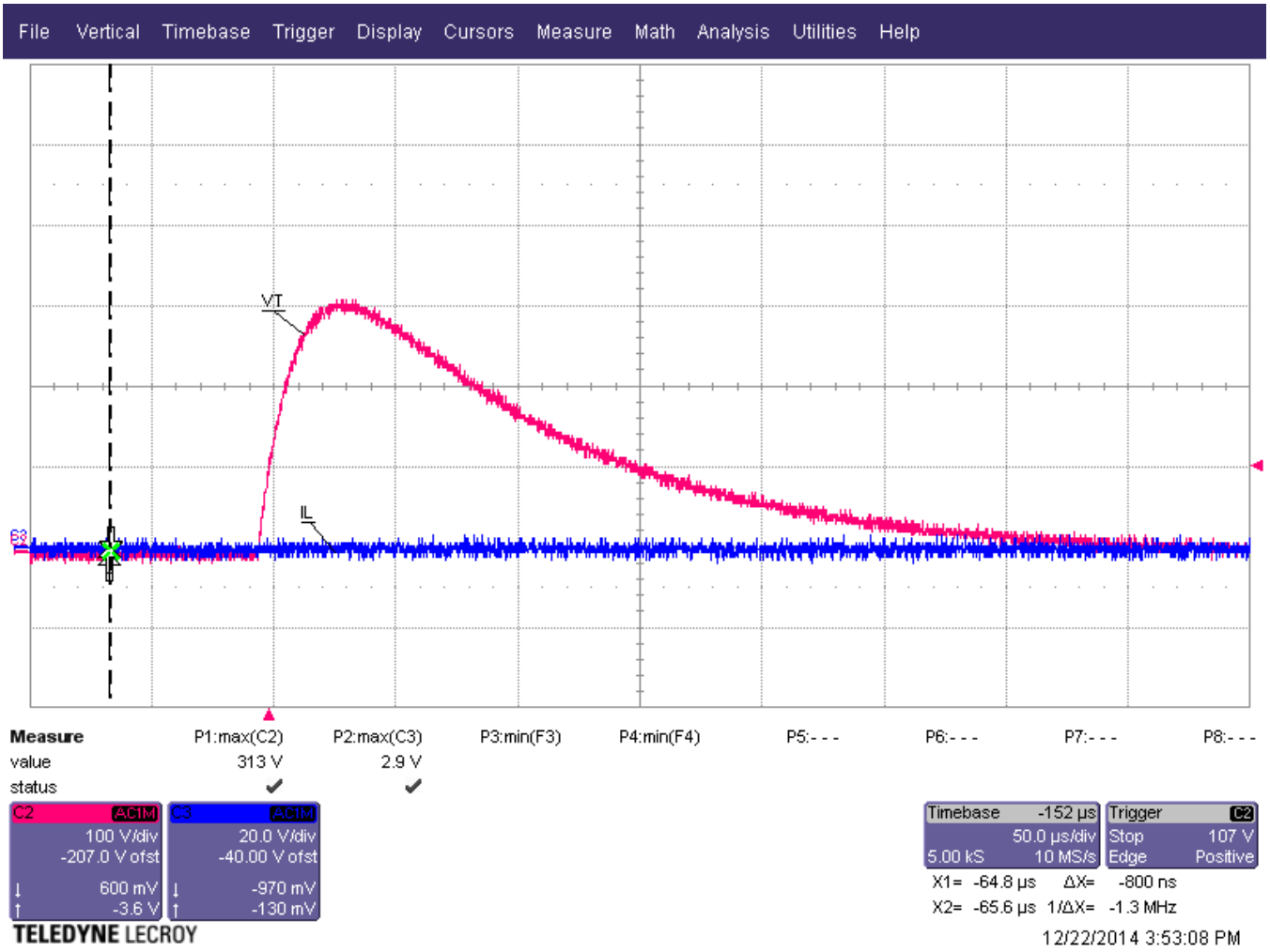
Horizontal	Time / Pt	100.000 ns	Sampling Mode	RealTime
	Pts / Div	500.0 S	Trigger Delay	-152 µs
Trigger	Mode	Stop	Slope	Positive
	Type	Edge	Level	87 V
	Source	C2	Coupling	DC

Lab Notebook Entry from LeCroy DSO
DSO S/N:
User: labadmin
Time: 12/22/2014 3:53:00 PM

Pin WF5a Test Pos - Chip SN3 - Sense 2

DLS EMC & Product Safety Testing • Consulting

Holt Integrated Electronics
Board 2 - Chip SN3
Pin Inj. WF5A (Direct Injection)
Level 3 - 300V/300A
Gen 300



Channel Status

		C2	C3
Vertical	V / Div	100 V	20.0 V
	Offset	-207.0 V	-40.00 V
	Coupling	AC1MΩ	AC1MΩ
	BW	Full	Full
	Probe	1.000e+3	100.000
	Sweeps	1 #	1 #

Acquisition Status

Time / Div	50.0 µs	Sampling Rate	10 MS/s

Horizontal	Time / Pt	100.000 ns	Sampling Mode	RealTime
	Pts / Div	500.0 S	Trigger Delay	-152 µs
Trigger	Mode	Stop	Slope	Positive
	Type	Edge	Level	107 V
	Source	C2	Coupling	DC