1250 Peterson Dr., Wheeling, IL 60090

Company: Holt Integrated Circuits, Inc.
Model Tested: HI-8597
Report Number: 18651
Project No. 5676

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 22 PIN INJECTION TEST PROCEDURE OF THE ABOVE TEST SPECIFICATION

Formal Name:	Single Rail ARINC 429 Differential Line Driver
Kind of Equipment:	ARINC 429 Line Driver
Test Configuration:	Tabletop (Tested at 3.3 Vdc)
Model Number(s):	HI-8597
Model(s) Tested:	HI-8597
Serial Number(s):	5, 6, 7
Date of Tests:	December 27, 2012
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.

1250 Peterson Dr., Wheeling, IL 60090

Company: Holt Integrated Circuits, Inc.
Model Tested: HI-8597
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SIGNATURE PAGE

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Lab Manager
EMC-002412-NE

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Brian J. Mattson
General Manager

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United States Department of Commerce
National Institute of Standards and Technology

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).

2012-10-01 through 2013-09-30
Effective dates

For the National Institute of Standards and Technology

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

1.0 INTRODUCTION:

On December 27, 2012, a series of susceptibility tests were made to demonstrate that the Single Rail ARINC 429 Differential Line Driver, Model Number(s) HI-8597, serial number 5, 6, 7, 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): 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 Single Rail ARINC 429 Differential Line Driver was placed on a copper bench measuring 20' long and 40" wide. The following describes the various Labs that are used for testing:

LAB H 20' long x 10' wide x 8' high screen shielded enclosure.

All lines leaving the room were filtered. The auxiliary equipment was located outside the main room.

The tests were run in the following labs:

LAB H Section 22, Lightning Inducted Transient Susceptibility

4.0 OPERATING CONDITIONS OF TEST SAMPLE:

All test measurements were made at a laboratory temperature of **74°F** at **34%** humidity with the following mode of operation:

Power up the device with 3.3 V supply at VDD, while SLP tied to VDD and TX0 and TX1 tied to GND. Supply current will measure approximately 29 mA. Lightning injection will be performed on pins TXOUTA and TXOUTB. The EUT Current is to be between 25 mA and 29 mA before and after the lightning pin injection test.

5.0 PERFORMANCE MONITORED:

The Single Rail ARINC 429 Differential Line Driver performance was monitored as follows:

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

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

6.1 3.3 V Single Rail ARINC 429 Differential Line Driver with Integrated Lightning Protection.

6.2 PHYSICAL DIMENSIONS OF EQUIPMENT UNDER TEST:

Length: 10.3 mm x Width: 10.3 mm x Height: 2.3 mm

6.3 LINE FILTER USED:

NA

6.4 INTERNAL CLOCK FREQUENCIES:

Switching Power Supply Frequencies: NA

Clock Frequencies: NA

6.5 DESCRIPTION OF ALL CIRCUIT BOARDS:

SN5; ARINC 429 Line Driver on a PCB	HI-8597PSIF Rev B Lot#12-08-7060; DC1245
SN6; ARINC 429 Line Driver on a PCB	HI-8597PSIF Rev B Lot#12-08-7060; DC1245
SN7; ARINC 429 Line Driver on a PCB	HI-8597PSIF Rev B Lot#12-08-7060; DC1245

7.0 ADDITIONAL DESCRIPTION OF EQUIPMENT UNDER TEST:
(See also Paragraph 6.0)

There were no changes made during testing.

8.0 REFERENCES:

1. Document No. RTCA/DO-160G, December 8, 2010
Prepared by: SC-135

9.0 TEST RESULTS:

The Single Rail ARINC 429 Differential Line Driver 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 A at the end of this report.

10.0 CONCLUSION OF SUSCEPTIBILITY TESTS:

The Single Rail ARINC 429 Differential Line Driver, Model Number(s) HI-8597, **meets** RTCA/DO-160G (December 8, 2010), Environmental conditions and Test Procedures for Airborne Equipment using test procedure(s) Section 22 Pin Injection. See the Appendix 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:

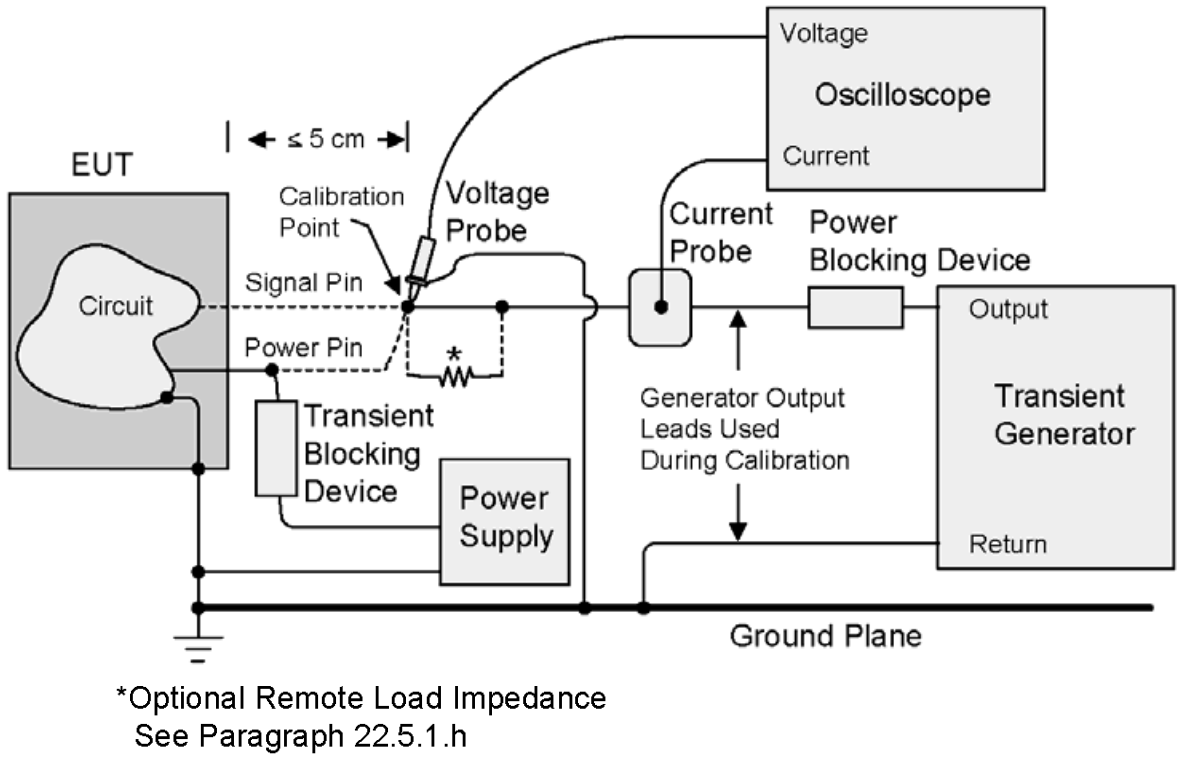
A3	B3	Z3	3
Pin Test Waveform Set	Pin Test Waveform Set	Pin Test Waveform Set	Pin Test Level

X = Tests not performed

The equipment under test was tested to the levels and waveforms consistent with its expected use and aircraft installation. The Single Rail ARINC 429 Differential Line Driver was subjected to Waveform(s) WF3, WF4, WF5A & WF5B using Level 3.

3.0 TEST SETUP AND APPARATUS:

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



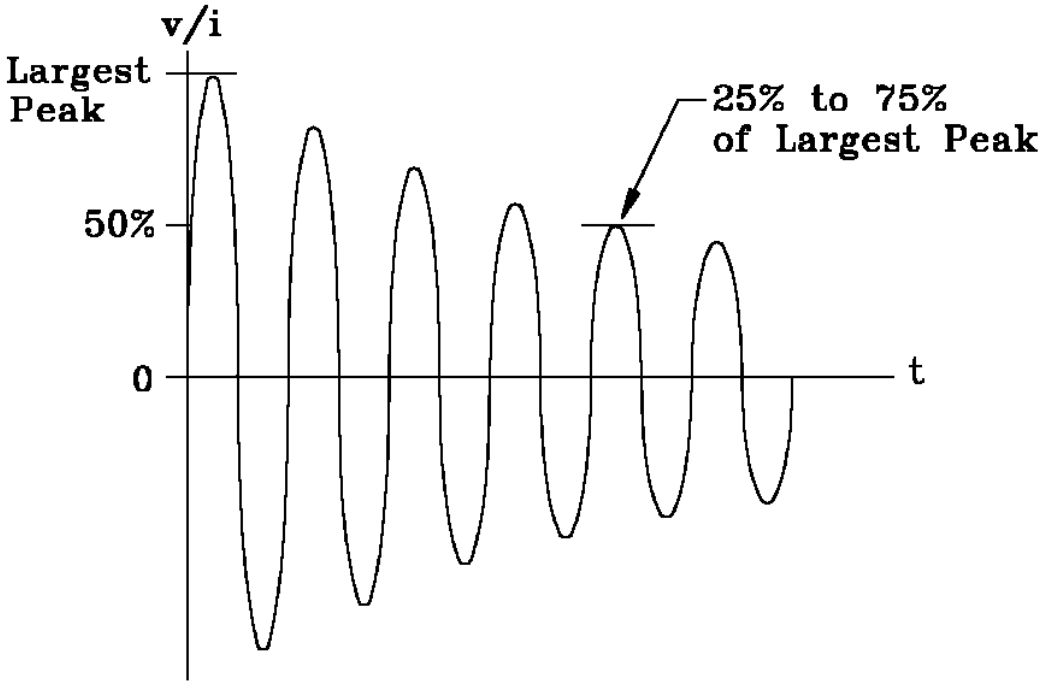
NOTES:

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.

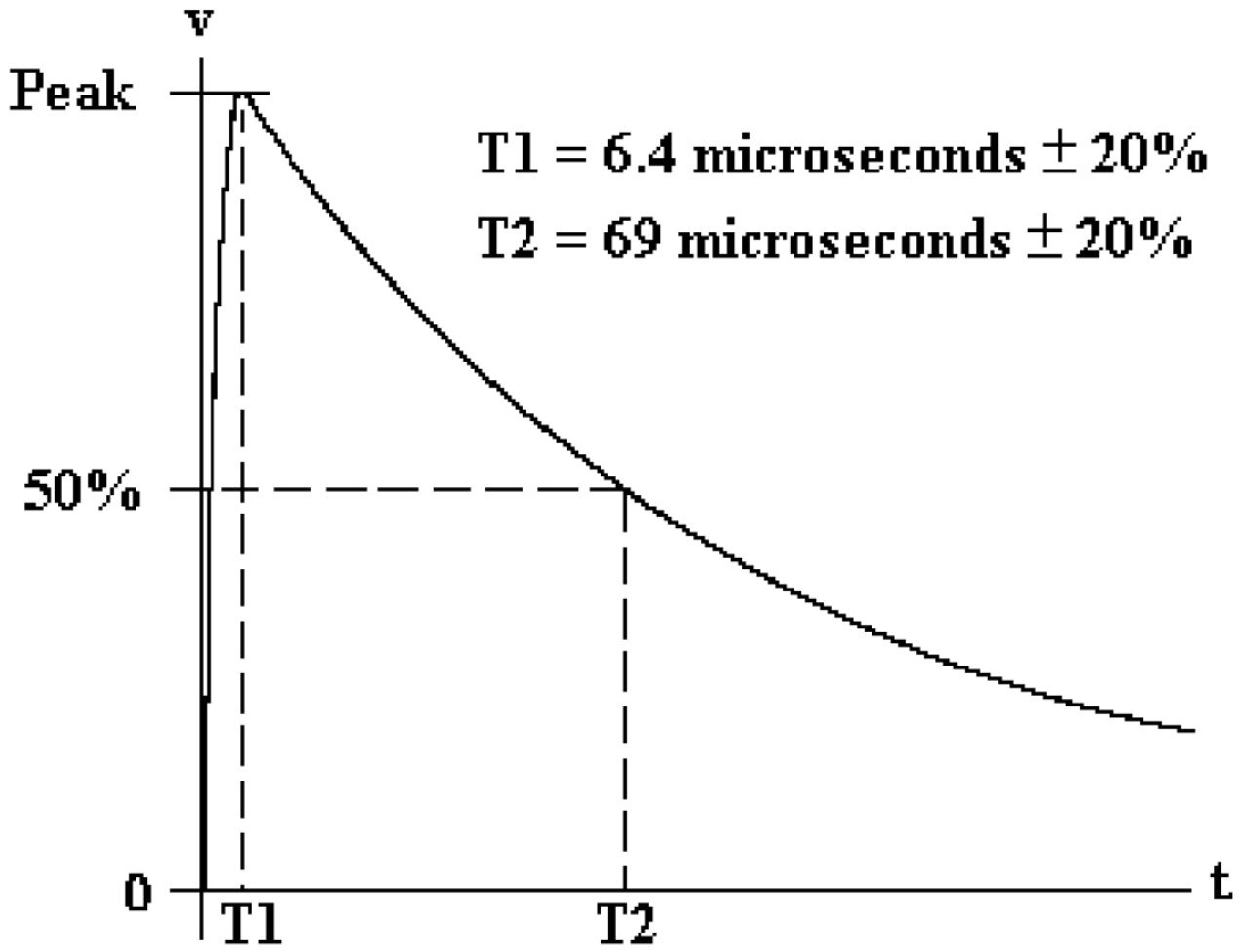


Figure 22-4 Voltage Waveform 4

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.

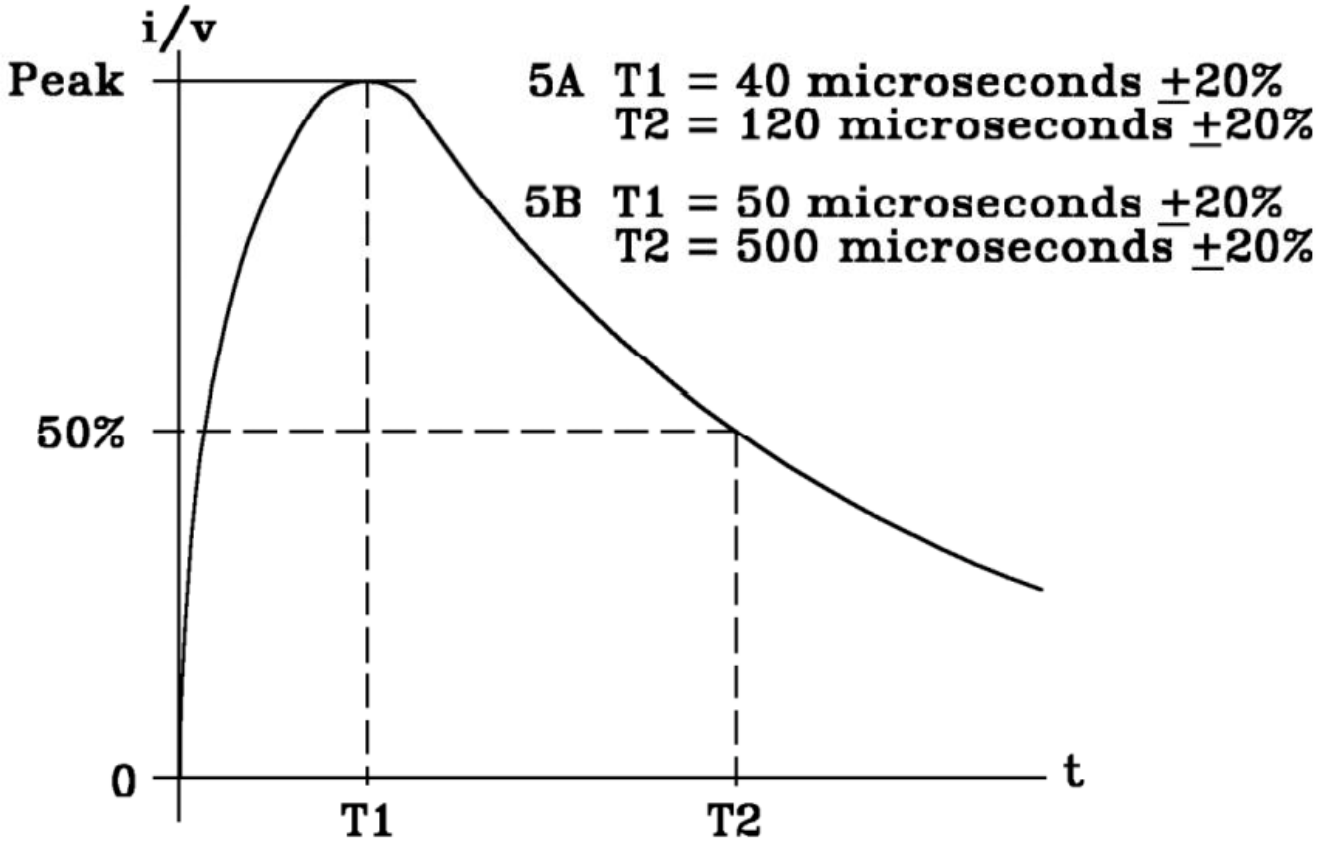


Figure 22-5 Current/Voltage Waveform 5

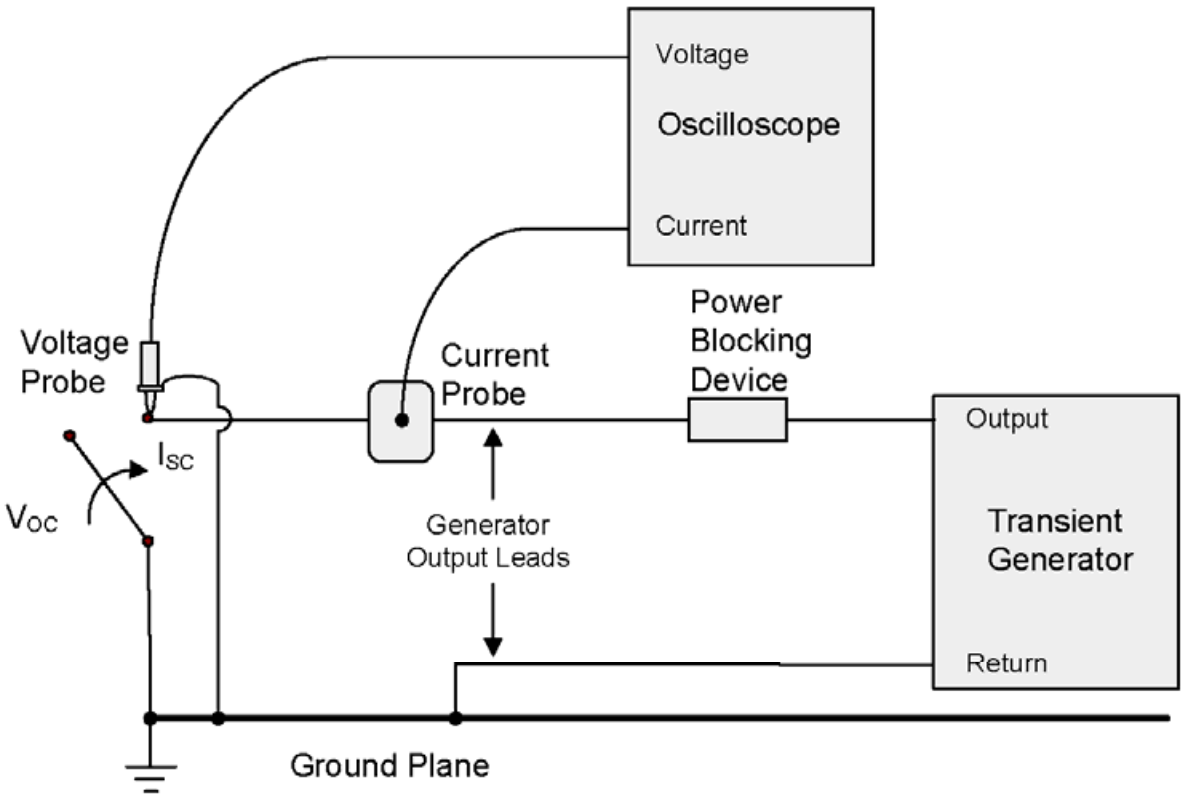
4.0 TEST PROCEDURE:

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), Waveform 4 (6.4 x 69us double exponential) and Waveform 5A (40 x 120 us) and Waveform 5B (50 x 500 us) were each applied at level 3 positive and negative polarities, to the Single Rail ARINC 429 Differential Line Driver pins called out in Table 22-1 & 22-2 of RTCA/DO-160G. The Single Rail ARINC 429 Differential Line Driver was not 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 wave shape applied to each pin was measured with a 1000x oscilloscope probe within 5cm of the pin. All wave shapes 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 wave shapes were applied to the pins and recorded. For each waveform, the wave shape 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 wave shape did not significantly vary between the first and tenth discharges. At regular intervals and after all events, the generators' open circuit calibration wave shape 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 Single Rail ARINC 429 Differential Line Driver passed the requirements of Section 22 (Pin Injection).

The Single Rail ARINC 429 Differential Line Driver **meets** the following conditions:

Lab used: H

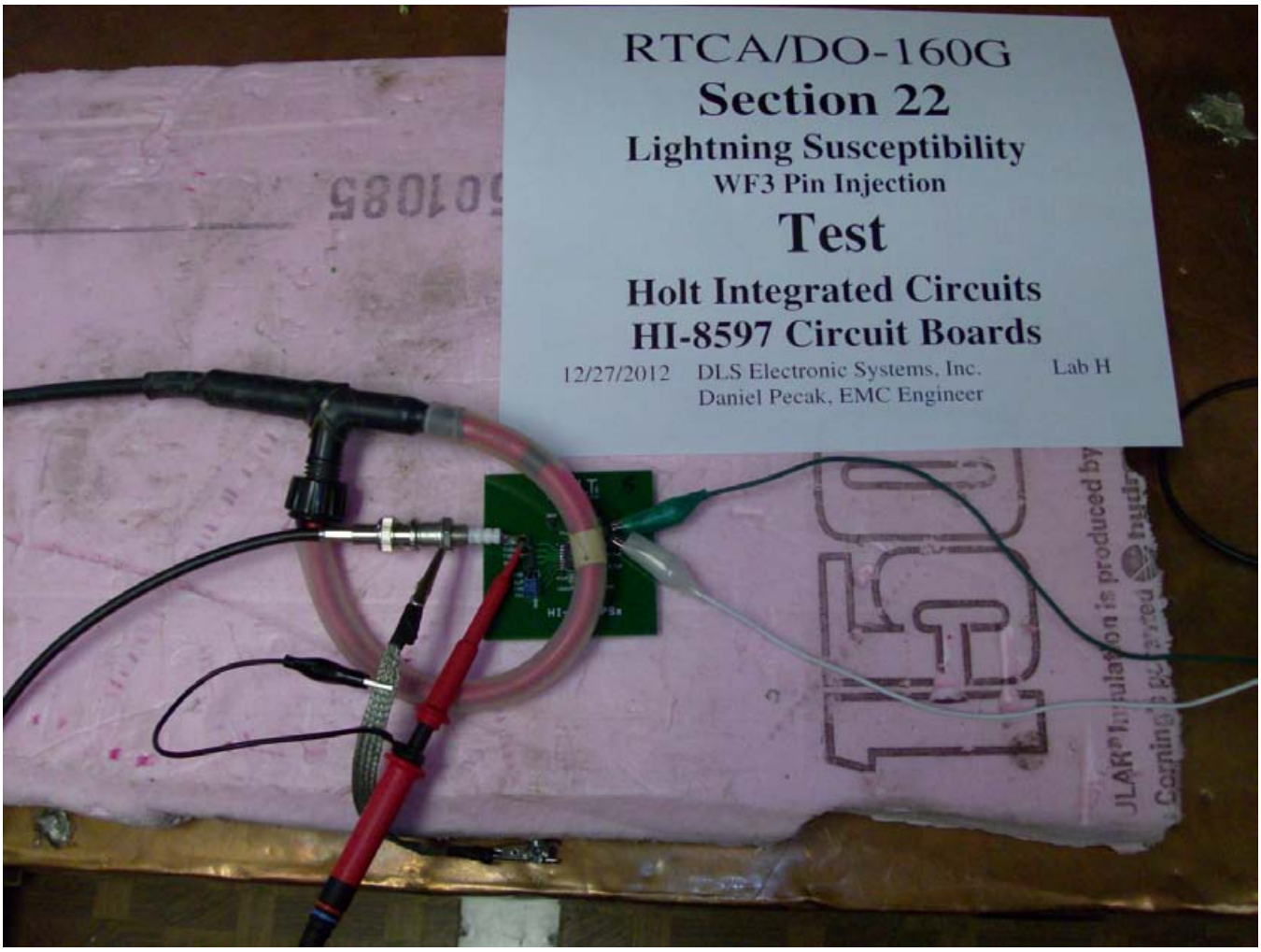
Summary:

There were no issues observed during Pin Injection Testing. The pre-test current draw of each board was 29 mA. The post-test current draw of each board was 29 mA indicating no damage. PCB#5, PCB#6, PCB#7 were the 3 boards subjected to the pin injection testing.

PCB#5--Category A3
PCB#6--Category B3
PCB#7--Category Z3 (WF3 and WF5B)

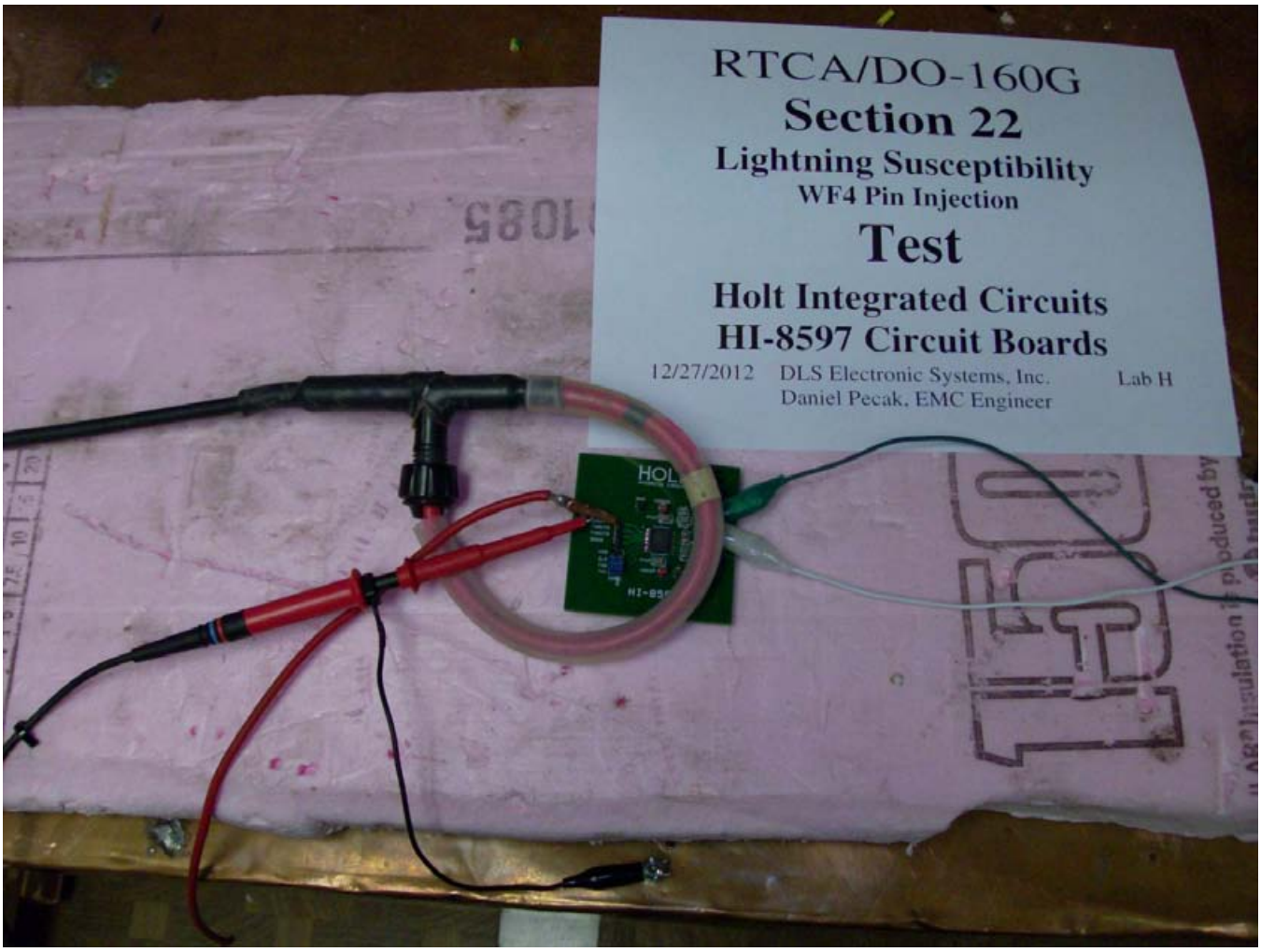
See the data sheets at the end of this appendix for the test results.

6.0 PHOTOS TAKEN DURING TESTING



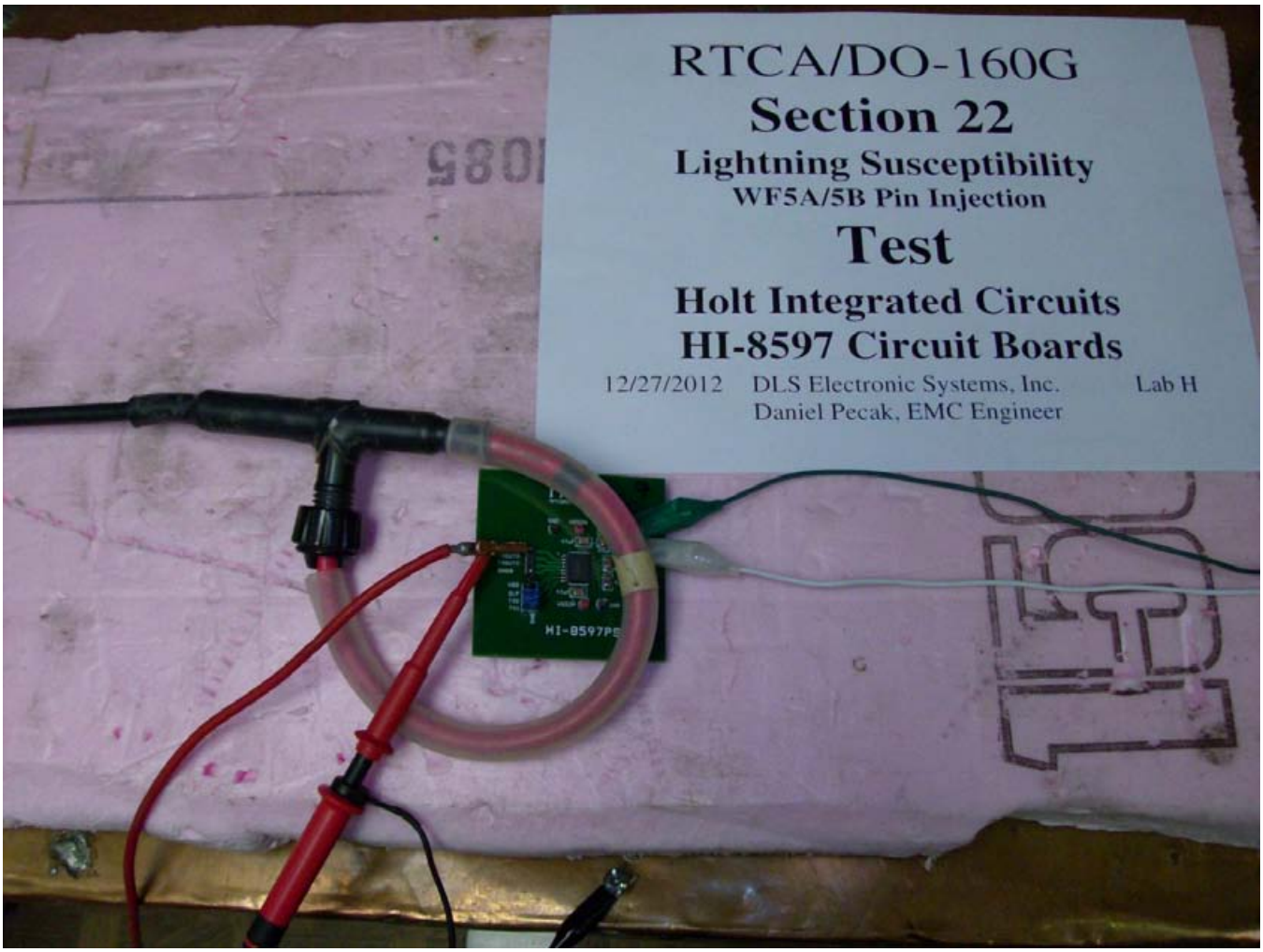
WF3 Pin Injection--Test

6.0 PHOTOS TAKEN DURING TESTING



WF4 Pin Injection--Test

6.0 PHOTOS TAKEN DURING TESTING



WF5A/5B Pin Injection--Test

6.0 PHOTOS TAKEN DURING TESTING

WF3 Pin Injection--OC Calibration

6.0 PHOTOS TAKEN DURING TESTING

WF3 Pin Injection--SC Calibration

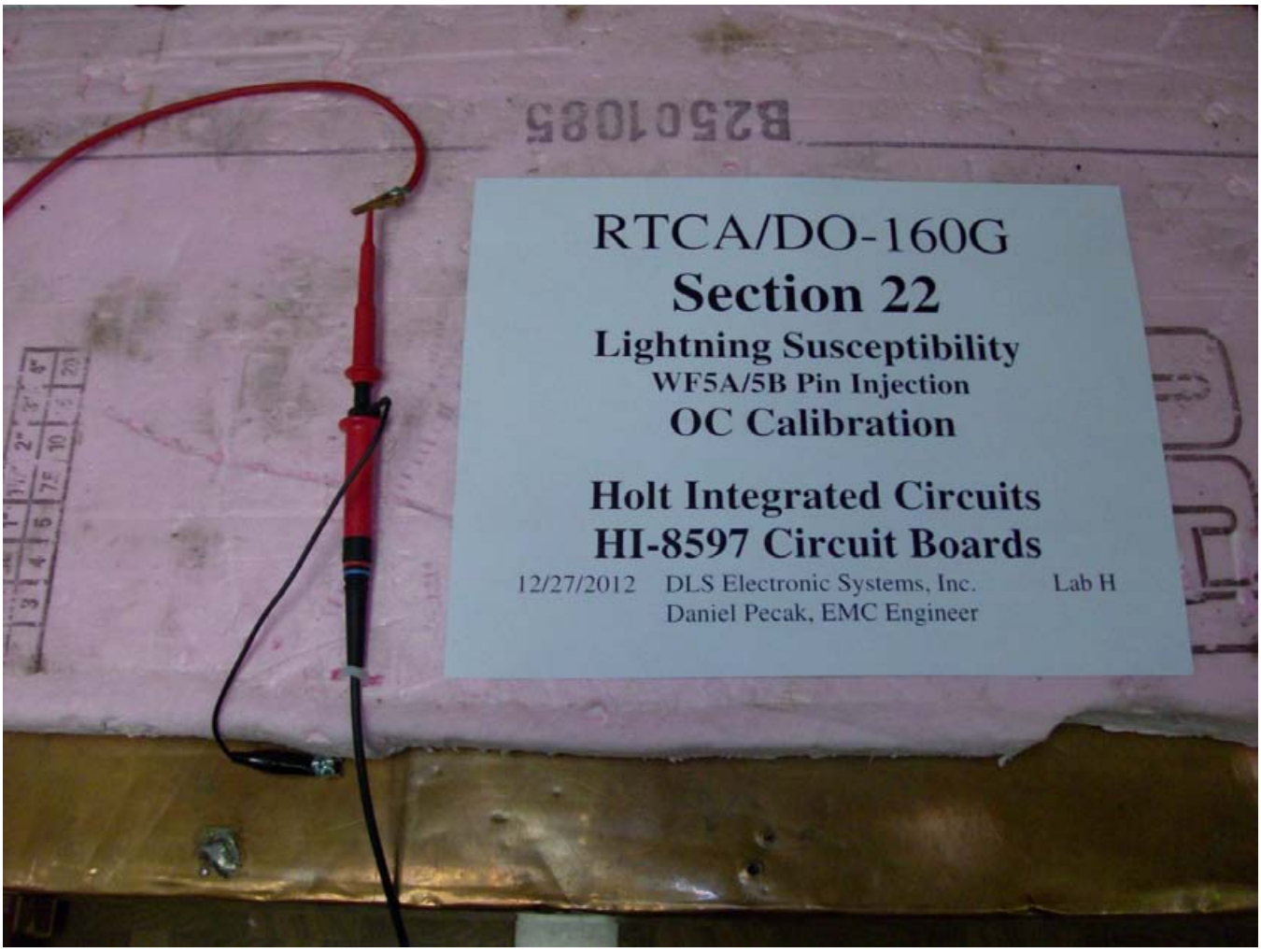
6.0 PHOTOS TAKEN DURING TESTING

WF4 Pin Injection--OC Calibration

6.0 PHOTOS TAKEN DURING TESTING

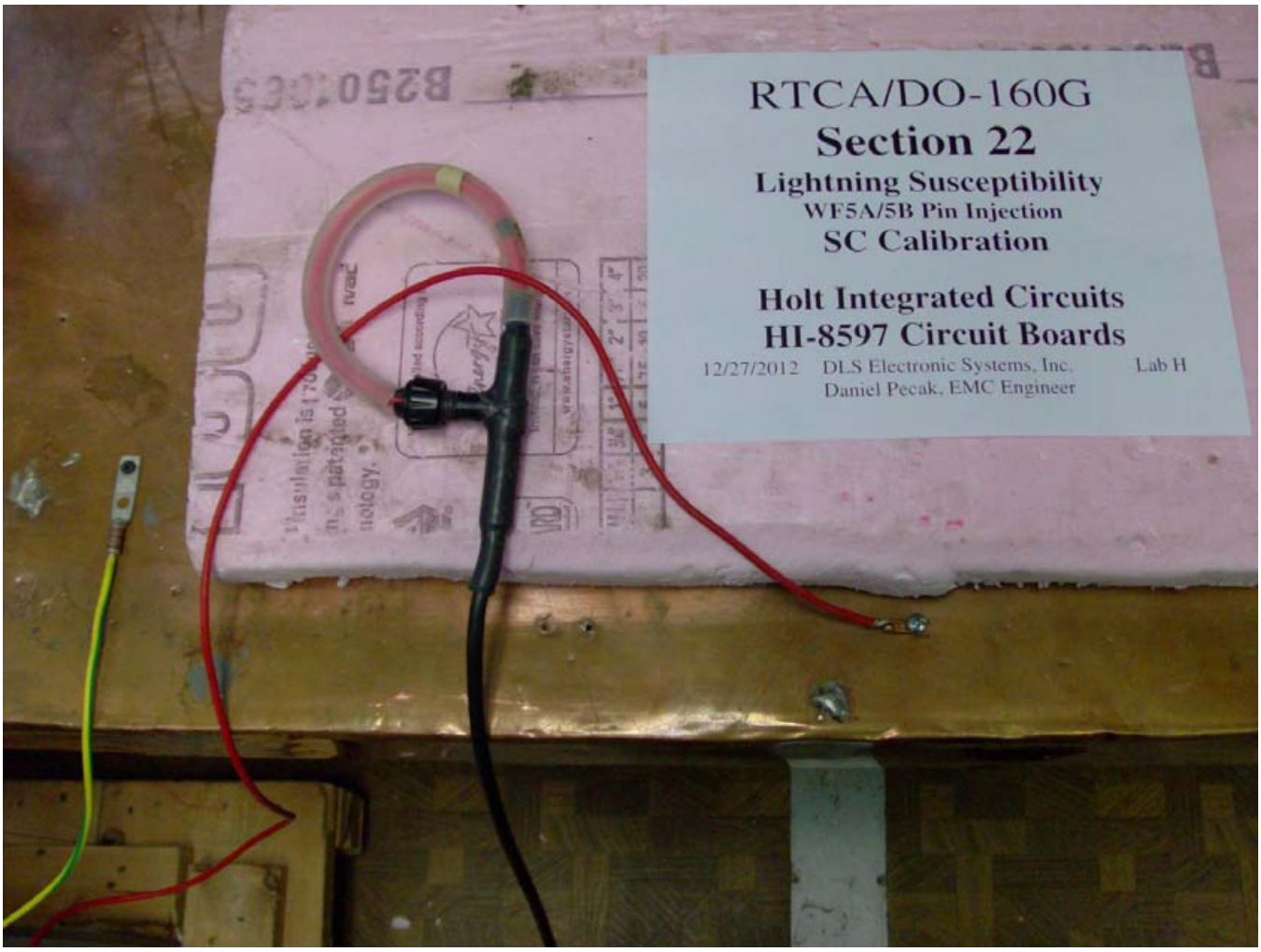
WF4 Pin Injection--SC Calibration

6.0 PHOTOS TAKEN DURING TESTING



WF5A/5B Pin Injection--OC Calibration

6.0 PHOTOS TAKEN DURING TESTING



WF5A/5B Pin Injection--SC Calibration

SECTION 22

TEST INSTRUMENTATION

Lightning Induced Transient Susceptibility

TABLE 1

Equipment	Manufacturer	Model Number	Serial Number	Range	Cal. On	Cal. Due
Oscilloscope	Agilent	54846A	US40240434	2.25 GHz	06/25/2012	06/25/2013
Current Probe	PEM	CWT 3R	10134-11407	16 MHz	07/17/2012	07/17/2013

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

SECTION 22

TEST EQUIPMENT

Lightning Induced Transient Susceptibility

TABLE 2

Equipment	Manufacturer	Model Number	Serial Number	Range
Transient Generator	EMC Partner	MIG0600MS	DLS#795	N/A
Transient Generator	EMC Partner	MIG-OS-MB	DLS#796	N/A

NOTE: The above test equipment is verified upon use.

PIN INJECTION TEST DATA SHEETS

WAVEFORM 3

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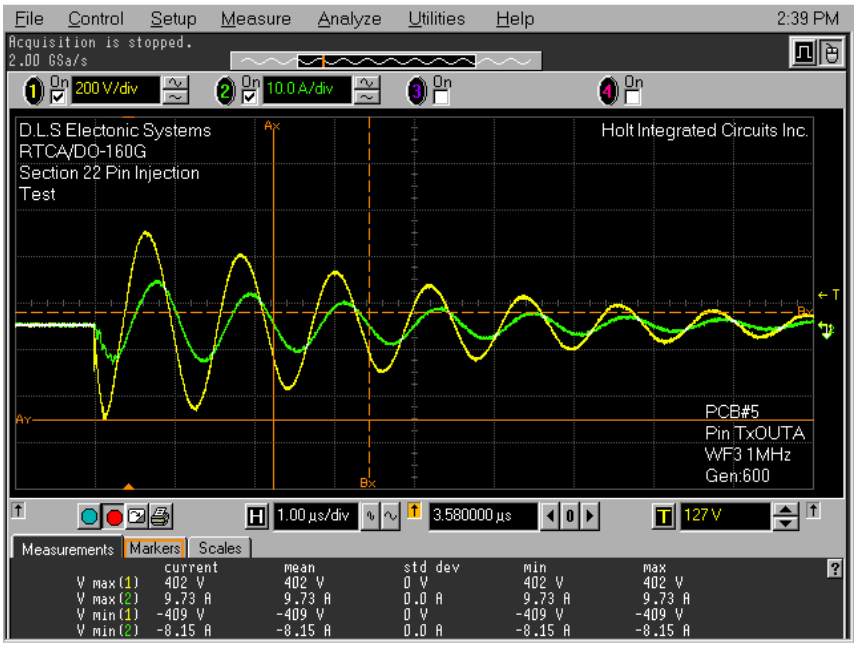

Acquisition
Sampling mode real time Configuration 4GSa/s
Memory depth manual Memory depth 32768pts
Sampling rate automatic Sampling rate 2.00 GSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 1
Scale 200 V/div Offset 94 V Coupling DC Impedance 1M Ohm
Attenuation 1.000 k : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Channel 2
Scale 10.0 A/div Offset 4.8 A Coupling DC Impedance 1M Ohm
Attenuation 100.0 : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Time base
Scale 1.00 µs/div Position 3.580000 µs Reference center

Trigger
Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 1 Trigger level 127 V Slope rising

Measure

	current	mean	std dev	min	max
V max(1)	402 V	402 V	0 V	402 V	402 V
V max(2)	9.73 A	9.73 A	0.0 A	9.73 A	9.73 A
V min(1)	-409 V	-409 V	0 V	-409 V	-409 V
V min(2)	-8.15 A	-8.15 A	0.0 A	-8.15 A	-8.15 A

Marker

	current	mean		X	Y
V max(1)	402 V	402 V	A——(1) =	1.8164 µs	-409 V
V max(2)	9.73 A	9.73 A	B---(1) =	3.0164 µs	56 V
V min(1)	-409 V	-409 V	Δ =	1.2000 µs	465 V
V min(2)	-8.15 A	-8.15 A	1/ΔX =	833.33 kHz	

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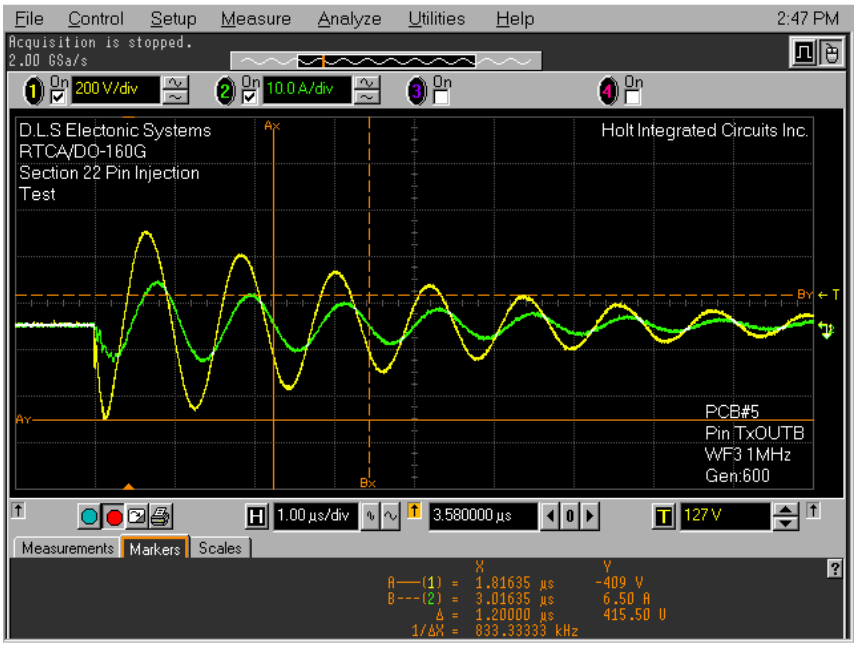

Acquisition
Sampling mode real time Configuration 4GSa/s
Memory depth manual Memory depth 32768pts
Sampling rate automatic Sampling rate 2.00 GSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 1
Scale 200 V/div Offset 94 V Coupling DC Impedance 1M Ohm
Attenuation 1.000 k : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Channel 2
Scale 10.0 A/div Offset 4.8 A Coupling DC Impedance 1M Ohm
Attenuation 100.0 : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Time base
Scale 1.00 µs/div Position 3.580000 µs Reference center

Trigger
Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 1 Trigger level 127 V Slope rising

Measure

	current	mean	std dev	min	max
V max(1)	405 V	391 V	20 V	376 V	405 V
V max(2)	9.54 A	8.44 A	1.55 A	7.34 A	9.54 A
V min(1)	-409 V	-386 V	32 V	-409 V	-364 V
V min(2)	-7.71 A	-8.10 A	560 mA	-8.49 A	-7.71 A

Marker

	current	mean		X	Y
V max(1)	405 V	391 V	A—(1) =	1.81635 µs	-409 V
V max(2)	9.54 A	8.44 A	B---(2) =	3.01635 µs	6.50 A
V min(1)	-409 V	-386 V	Δ =	1.20000 µs	415.50 V
V min(2)	-7.71 A	-8.10 A	1/ΔX =	833.33333 kHz	

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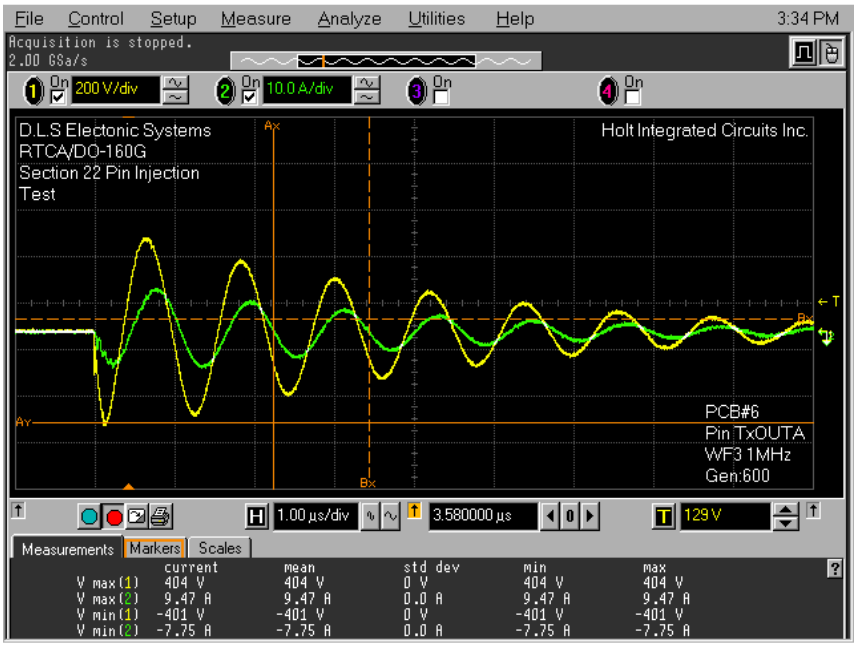

Acquisition
Sampling mode real time Configuration 4GSa/s
Memory depth manual Memory depth 32768pts
Sampling rate automatic Sampling rate 2.00 GSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 1
Scale 200 V/div Offset 122 V Coupling DC Impedance 1M Ohm
Attenuation 1.000 k : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Channel 2
Scale 10.0 A/div Offset 6.2 A Coupling DC Impedance 1M Ohm
Attenuation 100.0 : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Time base
Scale 1.00 µs/div Position 3.580000 µs Reference center

Trigger
Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 1 Trigger level 129 V Slope rising

Measure

	current	mean	std dev	min	max
V max(1)	404 V	404 V	0 V	404 V	404 V
V max(2)	9.47 A	9.47 A	0.0 A	9.47 A	9.47 A
V min(1)	-401 V	-401 V	0 V	-401 V	-401 V
V min(2)	-7.75 A	-7.75 A	0.0 A	-7.75 A	-7.75 A

Marker

	current	mean		X	Y
V max(1)	404 V	404 V	A——(1) =	1.81635 µs	-392 V
V max(2)	9.47 A	9.47 A	B---(1) =	3.01635 µs	56 V
V min(1)	-401 V	-401 V	Δ =	1.20000 µs	448 V
V min(2)	-7.75 A	-7.75 A	1/ΔX =	833.333 kHz	

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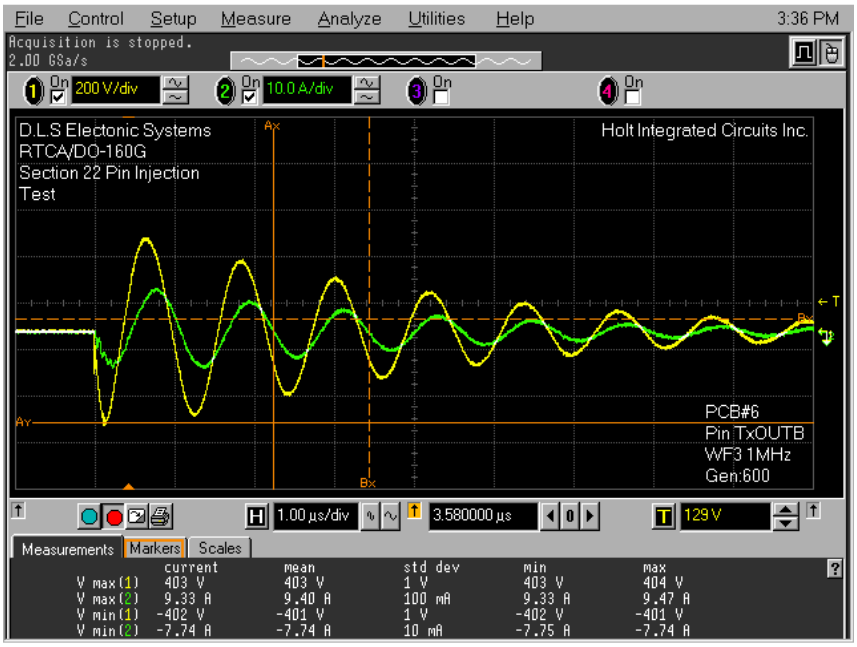

Acquisition
Sampling mode real time Configuration 4GSa/s
Memory depth manual Memory depth 32768pts
Sampling rate automatic Sampling rate 2.00 GSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 1
Scale 200 V/div Offset 122 V Coupling DC Impedance 1M Ohm
Attenuation 1.000 k : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Channel 2
Scale 10.0 A/div Offset 6.2 A Coupling DC Impedance 1M Ohm
Attenuation 100.0 : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Time base
Scale 1.00 µs/div Position 3.580000 µs Reference center

Trigger
Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 1 Trigger level 129 V Slope rising

Measure

	current	mean	std dev	min	max
V max(1)	403 V	403 V	1 V	403 V	404 V
V max(2)	9.33 A	9.40 A	100 mA	9.33 A	9.47 A
V min(1)	-402 V	-401 V	1 V	-402 V	-401 V
V min(2)	-7.74 A	-7.74 A	10 mA	-7.75 A	-7.74 A

Marker

	current	mean		X	Y
V max(1)	403 V	403 V	A——(1) =	1.81635 µs	-392 V
V max(2)	9.33 A	9.40 A	B---(1) =	3.01635 µs	56 V
V min(1)	-402 V	-401 V	Δ =	1.20000 µs	448 V
V min(2)	-7.74 A	-7.74 A	1/ΔX =	833.333 kHz	

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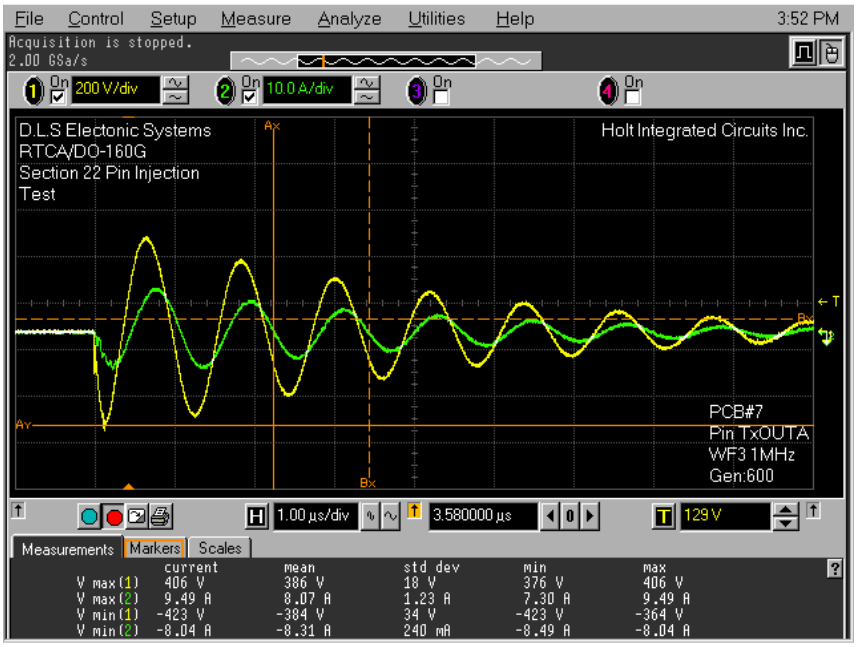

Acquisition
Sampling mode real time Configuration 4GSa/s
Memory depth manual Memory depth 32768pts
Sampling rate automatic Sampling rate 2.00 GSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 1
Scale 200 V/div Offset 122 V Coupling DC Impedance 1M Ohm
Attenuation 1.000 k : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Channel 2
Scale 10.0 A/div Offset 6.2 A Coupling DC Impedance 1M Ohm
Attenuation 100.0 : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Time base
Scale 1.00 µs/div Position 3.580000 µs Reference center

Trigger
Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 1 Trigger level 129 V Slope rising

Measure

	current	mean	std dev	min	max
V max(1)	406 V	386 V	18 V	376 V	406 V
V max(2)	9.49 A	8.07 A	1.23 A	7.30 A	9.49 A
V min(1)	-423 V	-384 V	34 V	-423 V	-364 V
V min(2)	-8.04 A	-8.31 A	240 mA	-8.49 A	-8.04 A

Marker

	current	mean		X	Y
V max(1)	406 V	386 V	A—(1) =	1.81635 µs	-404 V
V max(2)	9.49 A	8.07 A	B---(1) =	3.01635 µs	56 V
V min(1)	-423 V	-384 V	Δ =	1.20000 µs	460 V
V min(2)	-8.04 A	-8.31 A	1/ΔX =	833.333 kHz	

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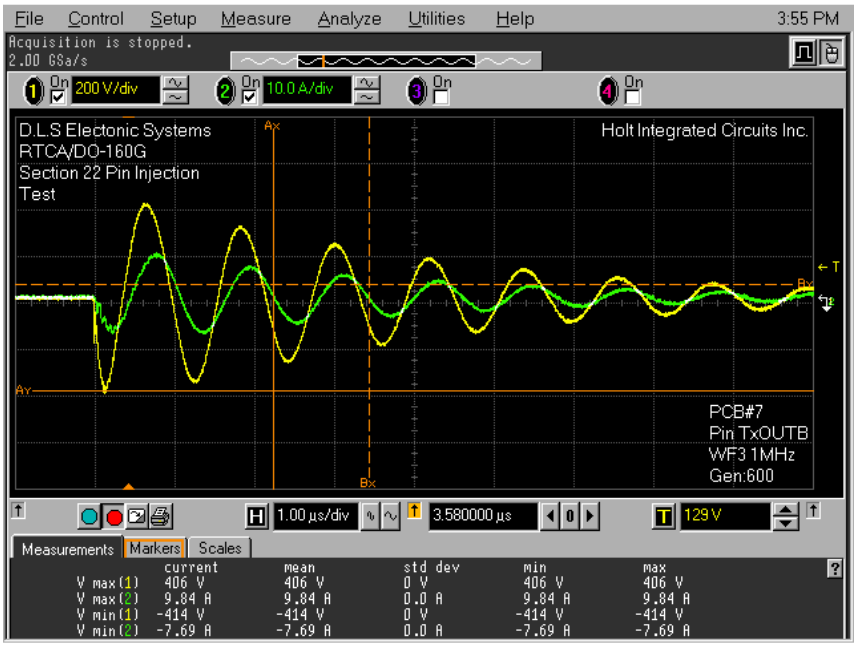

Acquisition
Sampling mode real time Configuration 4GSa/s
Memory depth manual Memory depth 32768pts
Sampling rate automatic Sampling rate 2.00 GSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 1
Scale 200 V/div Offset -24 V Coupling DC Impedance 1M Ohm
Attenuation 1.000 k : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Channel 2
Scale 10.0 A/div Offset -1.1 A Coupling DC Impedance 1M Ohm
Attenuation 100.0 : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Time base
Scale 1.00 µs/div Position 3.580000 µs Reference center

Trigger
Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 1 Trigger level 129 V Slope rising

Measure

	current	mean	std dev	min	max
V max(1)	406 V	406 V	0 V	406 V	406 V
V max(2)	9.84 A	9.84 A	0.0 A	9.84 A	9.84 A
V min(1)	-414 V	-414 V	0 V	-414 V	-414 V
V min(2)	-7.69 A	-7.69 A	0.0 A	-7.69 A	-7.69 A

Marker

	current	mean		X	Y
V max(1)	406 V	406 V	A——(1) =	1.81635 µs	-404 V
V max(2)	9.84 A	9.84 A	B---(1) =	3.01635 µs	56 V
V min(1)	-414 V	-414 V	Δ =	1.20000 µs	460 V
V min(2)	-7.69 A	-7.69 A	1/ΔX =	833.333 kHz	

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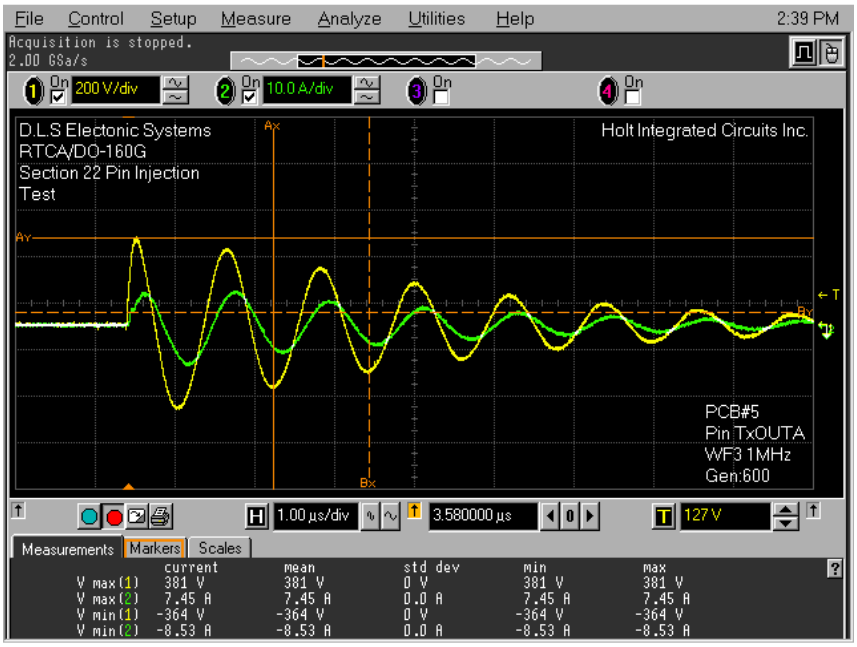

Acquisition
Sampling mode real time Configuration 4GSa/s
Memory depth manual Memory depth 32768pts
Sampling rate automatic Sampling rate 2.00 GSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 1
Scale 200 V/div Offset 94 V Coupling DC Impedance 1M Ohm
Attenuation 1.000 k : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Channel 2
Scale 10.0 A/div Offset 4.8 A Coupling DC Impedance 1M Ohm
Attenuation 100.0 : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Time base
Scale 1.00 µs/div Position 3.580000 µs Reference center

Trigger
Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 1 Trigger level 127 V Slope rising

Measure

	current	mean	std dev	min	max
V max(1)	381 V	381 V	0 V	381 V	381 V
V max(2)	7.45 A	7.45 A	0.0 A	7.45 A	7.45 A
V min(1)	-364 V	-364 V	0 V	-364 V	-364 V
V min(2)	-8.53 A	-8.53 A	0.0 A	-8.53 A	-8.53 A

Marker

	current	mean		X	Y
V max(1)	381 V	381 V	A—(1) =	1.8164 µs	374 V
V max(2)	7.45 A	7.45 A	B---(1) =	3.0164 µs	56 V
V min(1)	-364 V	-364 V	Δ =	1.2000 µs	-318 V
V min(2)	-8.53 A	-8.53 A	1/ΔX =	833.33 kHz	

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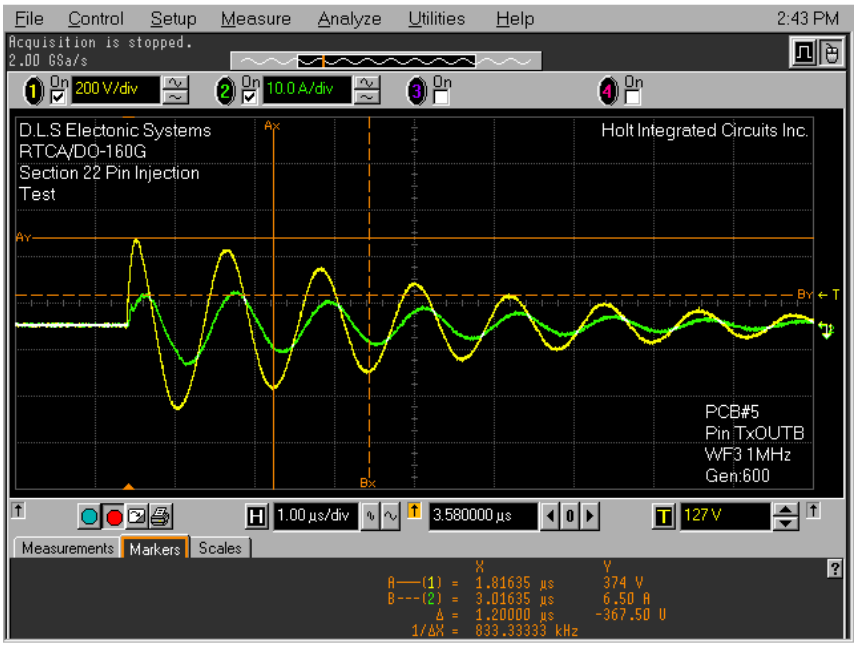

Acquisition
Sampling mode real time Configuration 4GSa/s
Memory depth manual Memory depth 32768pts
Sampling rate automatic Sampling rate 2.00 GSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 1
Scale 200 V/div Offset 94 V Coupling DC Impedance 1M Ohm
Attenuation 1.000 k : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Channel 2
Scale 10.0 A/div Offset 4.8 A Coupling DC Impedance 1M Ohm
Attenuation 100.0 : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Time base
Scale 1.00 µs/div Position 3.580000 µs Reference center

Trigger
Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 1 Trigger level 127 V Slope rising

Measure

	current	mean	std dev	min	max
V max(1)	376 V	376 V	0 V	376 V	376 V
V max(2)	7.34 A	7.34 A	0.0 A	7.34 A	7.34 A
V min(1)	-364 V	-364 V	0 V	-364 V	-364 V
V min(2)	-8.49 A	-8.49 A	0.0 A	-8.49 A	-8.49 A

Marker

	current	mean		X	Y
V max(1)	376 V	376 V	A—(1) =	1.81635 µs	374 V
V max(2)	7.34 A	7.34 A	B---(2) =	3.01635 µs	6.50 A
V min(1)	-364 V	-364 V	Δ =	1.20000 µs	-367.50 V
V min(2)	-8.49 A	-8.49 A	1/ΔX =	833.33333 kHz	

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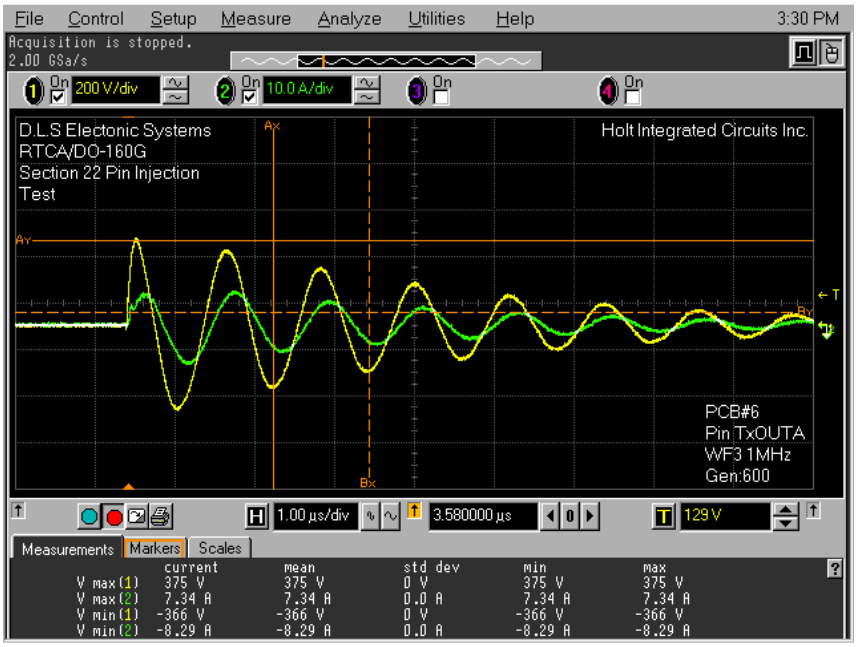

Acquisition
Sampling mode real time Configuration 4GSa/s
Memory depth manual Memory depth 32768pts
Sampling rate automatic Sampling rate 2.00 GSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 1
Scale 200 V/div Offset 94 V Coupling DC Impedance 1M Ohm
Attenuation 1.000 k : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Channel 2
Scale 10.0 A/div Offset 4.8 A Coupling DC Impedance 1M Ohm
Attenuation 100.0 : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Time base
Scale 1.00 µs/div Position 3.580000 µs Reference center

Trigger
Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 1 Trigger level 129 V Slope rising

Measure

	current	mean	std dev	min	max
V max(1)	375 V	375 V	0 V	375 V	375 V
V max(2)	7.34 A	7.34 A	0.0 A	7.34 A	7.34 A
V min(1)	-366 V	-366 V	0 V	-366 V	-366 V
V min(2)	-8.29 A	-8.29 A	0.0 A	-8.29 A	-8.29 A

Marker

	current	mean		X	Y
V max(1)	375 V	375 V	A—(1) =	1.81635 µs	363 V
V max(2)	7.34 A	7.34 A	B---(1) =	3.01635 µs	56.0 V
V min(1)	-366 V	-366 V	Δ =	1.20000 µs	-307 V
V min(2)	-8.29 A	-8.29 A	1/ΔX =	833.333 kHz	

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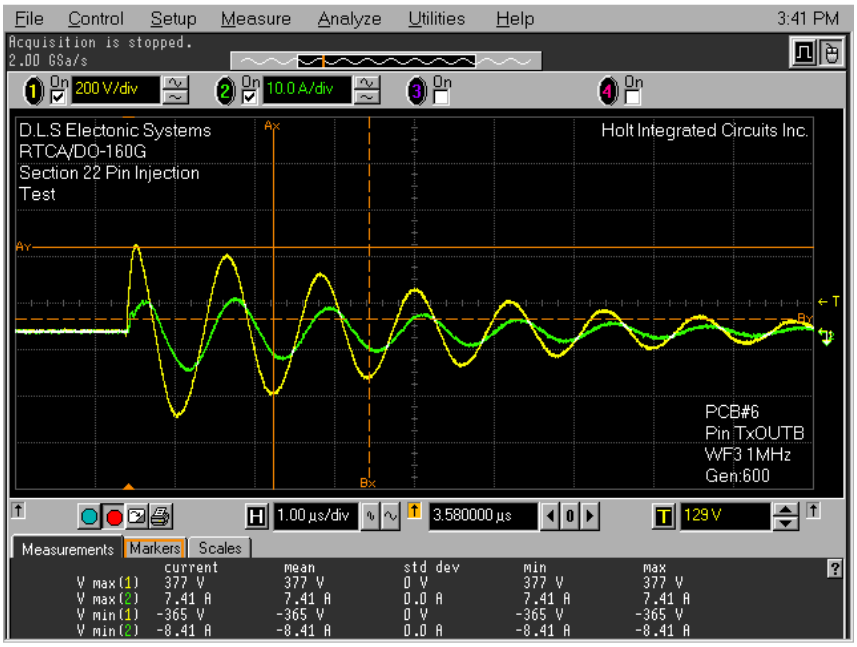

Acquisition
Sampling mode real time Configuration 4GSa/s
Memory depth manual Memory depth 32768pts
Sampling rate automatic Sampling rate 2.00 GSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 1
Scale 200 V/div Offset 122 V Coupling DC Impedance 1M Ohm
Attenuation 1.000 k : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Channel 2
Scale 10.0 A/div Offset 6.2 A Coupling DC Impedance 1M Ohm
Attenuation 100.0 : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Time base
Scale 1.00 µs/div Position 3.580000 µs Reference center

Trigger
Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 1 Trigger level 129 V Slope rising

Measure

	current	mean	std dev	min	max
V max(1)	377 V	377 V	0 V	377 V	377 V
V max(2)	7.41 A	7.41 A	0.0 A	7.41 A	7.41 A
V min(1)	-365 V	-365 V	0 V	-365 V	-365 V
V min(2)	-8.41 A	-8.41 A	0.0 A	-8.41 A	-8.41 A

Marker

	current	mean		X	Y
V max(1)	377 V	377 V	A—(1) =	1.81635 µs	362 V
V max(2)	7.41 A	7.41 A	B---(1) =	3.01635 µs	56 V
V min(1)	-365 V	-365 V	Δ =	1.20000 µs	-306 V
V min(2)	-8.41 A	-8.41 A	1/ΔX =	833.333 kHz	

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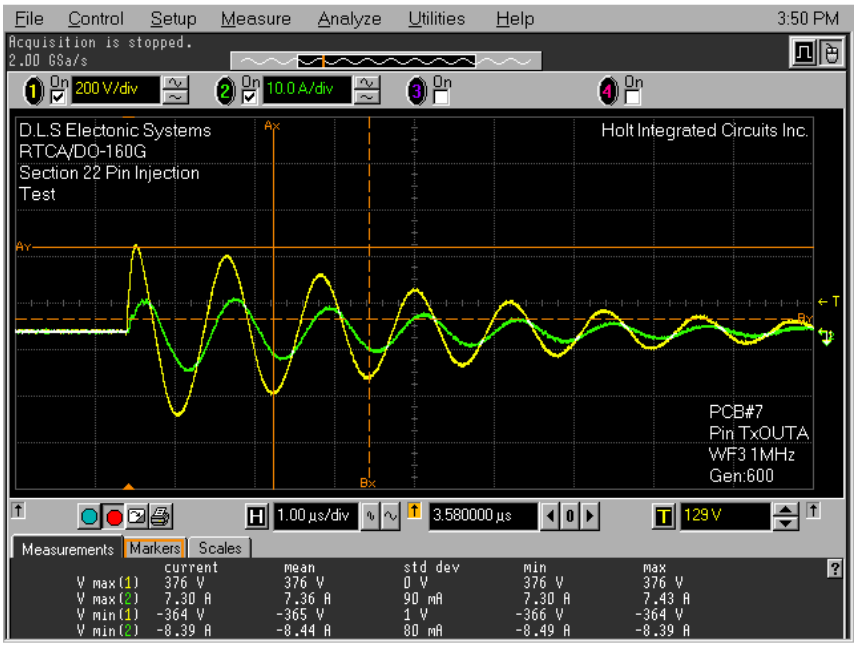

Acquisition
Sampling mode real time Configuration 4GSa/s
Memory depth manual Memory depth 32768pts
Sampling rate automatic Sampling rate 2.00 GSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 1
Scale 200 V/div Offset 122 V Coupling DC Impedance 1M Ohm
Attenuation 1.000 k : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Channel 2
Scale 10.0 A/div Offset 6.2 A Coupling DC Impedance 1M Ohm
Attenuation 100.0 : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Time base
Scale 1.00 µs/div Position 3.580000 µs Reference center

Trigger
Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 1 Trigger level 129 V Slope rising

Measure

	current	mean	std dev	min	max
V max(1)	376 V	376 V	0 V	376 V	376 V
V max(2)	7.30 A	7.36 A	90 mA	7.30 A	7.43 A
V min(1)	-364 V	-365 V	1 V	-366 V	-364 V
V min(2)	-8.39 A	-8.44 A	80 mA	-8.49 A	-8.39 A

Marker

	current	mean		X	Y
V max(1)	376 V	376 V	A——(1) =	1.81635 µs	362 V
V max(2)	7.30 A	7.36 A	B---(1) =	3.01635 µs	56 V
V min(1)	-364 V	-365 V	Δ =	1.20000 µs	-306 V
V min(2)	-8.39 A	-8.44 A	1/ΔX =	833.333 kHz	

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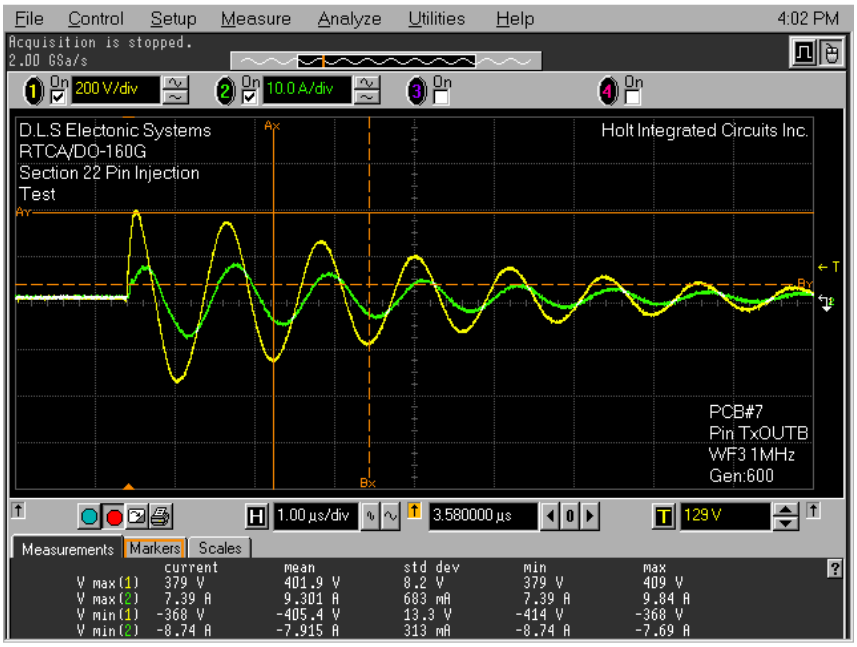

Acquisition
Sampling mode real time Configuration 4GSa/s
Memory depth manual Memory depth 32768pts
Sampling rate automatic Sampling rate 2.00 GSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 1
Scale 200 V/div Offset -24 V Coupling DC Impedance 1M Ohm
Attenuation 1.000 k : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Channel 2
Scale 10.0 A/div Offset -1.1 A Coupling DC Impedance 1M Ohm
Attenuation 100.0 : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Time base
Scale 1.00 µs/div Position 3.580000 µs Reference center

Trigger
Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 1 Trigger level 129 V Slope rising

Measure

	current	mean	std dev	min	max
V max(1)	379 V	401.9 V	8.2 V	379 V	409 V
V max(2)	7.39 A	9.301 A	683 mA	7.39 A	9.84 A
V min(1)	-368 V	-405.4 V	13.3 V	-414 V	-368 V
V min(2)	-8.74 A	-7.915 A	313 mA	-8.74 A	-7.69 A

Marker

	current	mean		X	Y
V max(1)	379 V	401.9 V	A—(1) =	1.81635 µs	365 V
V max(2)	7.39 A	9.301 A	B---(1) =	3.01635 µs	56 V
V min(1)	-368 V	-405.4 V	Δ =	1.20000 µs	-309 V
V min(2)	-8.74 A	-7.915 A	1/ΔX =	833.333 kHz	

PIN INJECTION TEST DATA SHEETS

WAVEFORM 4

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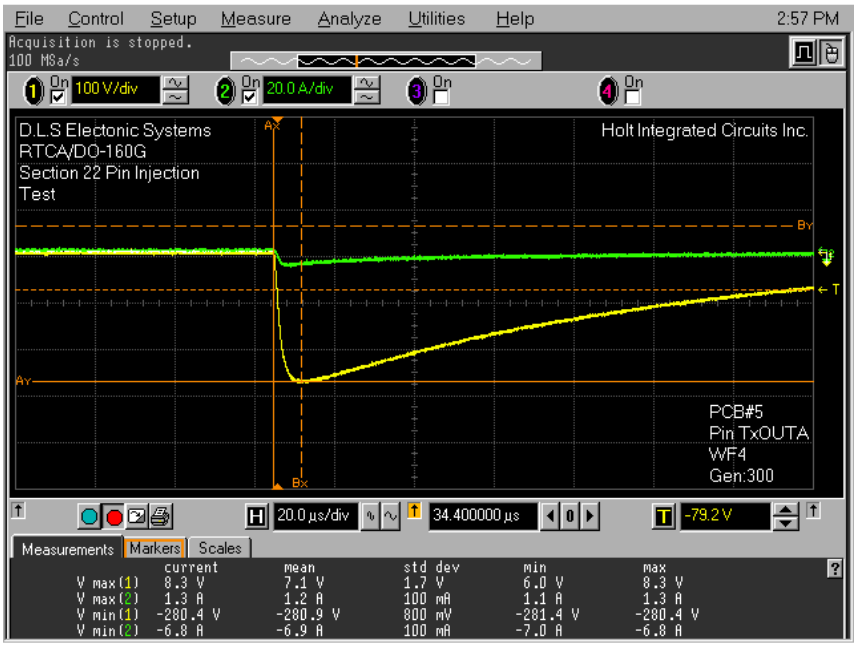

Acquisition
Sampling mode real time Configuration 4GSa/s
Memory depth manual Memory depth 32768pts
Sampling rate automatic Sampling rate 100 MSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 1
Scale 100 V/div Offset -109 V Coupling DC Impedance 1M Ohm
Attenuation 1.000 k : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Channel 2
Scale 20.0 A/div Offset -22.6 A Coupling DC Impedance 1M Ohm
Attenuation 100.0 : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Time base
Scale 20.0 µs/div Position 34.400000 µs Reference center

Trigger
Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 1 Trigger level -79.2 V Slope falling

Measure

	current	mean	std dev	min	max
V max(1)	8.3 V	7.1 V	1.7 V	6.0 V	8.3 V
V max(2)	1.3 A	1.2 A	100 mA	1.1 A	1.3 A
V min(1)	-280.4 V	-280.9 V	800 mV	-281.4 V	-280.4 V
V min(2)	-6.8 A	-6.9 A	100 mA	-7.0 A	-6.8 A

Marker

	current	mean	X	Y
V max(1)	8.3 V	7.1 V	A——(1) = -933.5 ns	-278.0 V
V max(2)	1.3 A	1.2 A	B---(1) = 6.0665 µs	56.0 V
V min(1)	-280.4 V	-280.9 V	Δ = 7.0000 µs	334.0 V
V min(2)	-6.8 A	-6.9 A	1/ΔX = 142.857 kHz	

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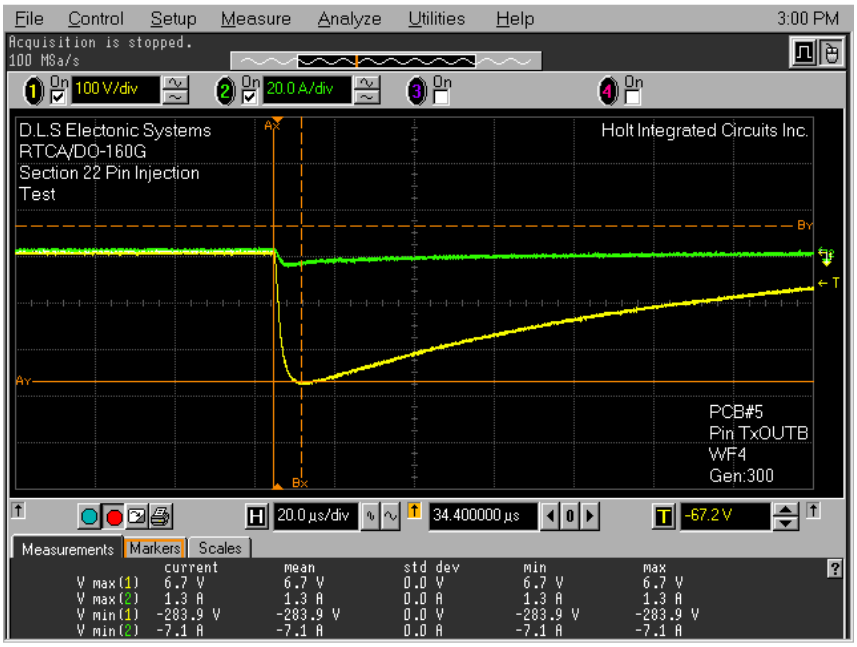

Acquisition
Sampling mode real time Configuration 4GSa/s
Memory depth manual Memory depth 32768pts
Sampling rate automatic Sampling rate 100 MSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 1
Scale 100 V/div Offset -109 V Coupling DC Impedance 1M Ohm
Attenuation 1.000 k : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Channel 2
Scale 20.0 A/div Offset -22.6 A Coupling DC Impedance 1M Ohm
Attenuation 100.0 : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Time base
Scale 20.0 µs/div Position 34.400000 µs Reference center

Trigger
Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 1 Trigger level -67.2 V Slope falling

Measure

	current	mean	std dev	min	max
V max(1)	6.7 V	6.7 V	0.0 V	6.7 V	6.7 V
V max(2)	1.3 A	1.3 A	0.0 A	1.3 A	1.3 A
V min(1)	-283.9 V	-283.9 V	0.0 V	-283.9 V	-283.9 V
V min(2)	-7.1 A	-7.1 A	0.0 A	-7.1 A	-7.1 A

Marker

	current	mean		X	Y
V max(1)	6.7 V	6.7 V	A——(1) =	-933.5 ns	-278.0 V
V max(2)	1.3 A	1.3 A	B---(1) =	6.0665 µs	56.0 V
V min(1)	-283.9 V	-283.9 V	Δ =	7.0000 µs	334.0 V
V min(2)	-7.1 A	-7.1 A	1/ΔX =	142.857 kHz	

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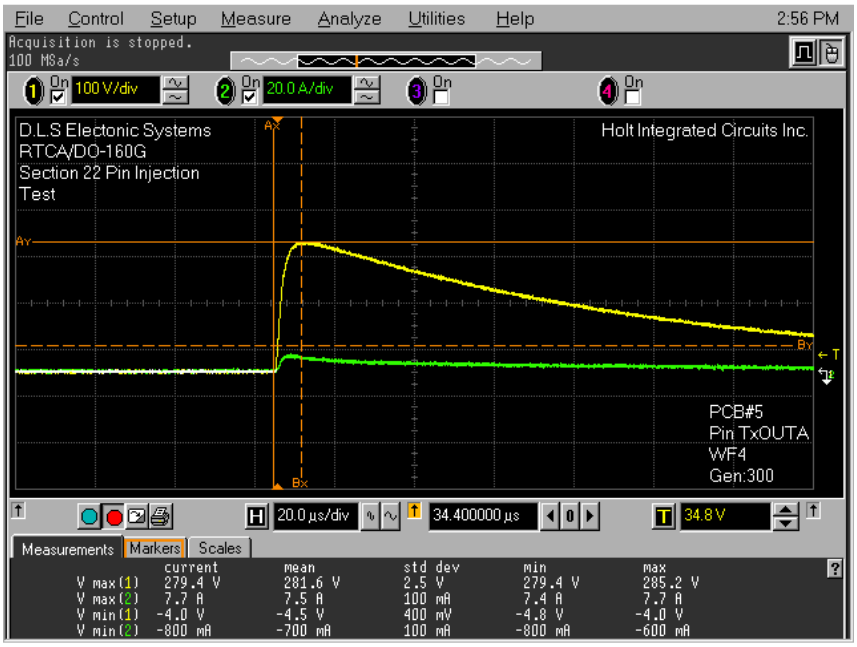

Acquisition
Sampling mode real time Configuration 4GSa/s
Memory depth manual Memory depth 32768pts
Sampling rate automatic Sampling rate 100 MSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 1
Scale 100 V/div Offset 147 V Coupling DC Impedance 1M Ohm
Attenuation 1.000 k : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Channel 2
Scale 20.0 A/div Offset 29.4 A Coupling DC Impedance 1M Ohm
Attenuation 100.0 : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Time base
Scale 20.0 µs/div Position 34.400000 µs Reference center

Trigger
Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 1 Trigger level 34.8 V Slope rising

Measure

	current	mean	std dev	min	max
V max(1)	279.4 V	281.6 V	2.5 V	279.4 V	285.2 V
V max(2)	7.7 A	7.5 A	100 mA	7.4 A	7.7 A
V min(1)	-4.0 V	-4.5 V	400 mV	-4.8 V	-4.0 V
V min(2)	-800 mA	-700 mA	100 mA	-800 mA	-600 mA

Marker

	current	mean	X	Y
V max(1)	279.4 V	281.6 V	A——(1) = -933.5 ns	278.0 V
V max(2)	7.7 A	7.5 A	B---(1) = 6.0665 µs	56.0 V
V min(1)	-4.0 V	-4.5 V	Δ = 7.0000 µs	-222.0 V
V min(2)	-800 mA	-700 mA	1/ΔX = 142.857 kHz	

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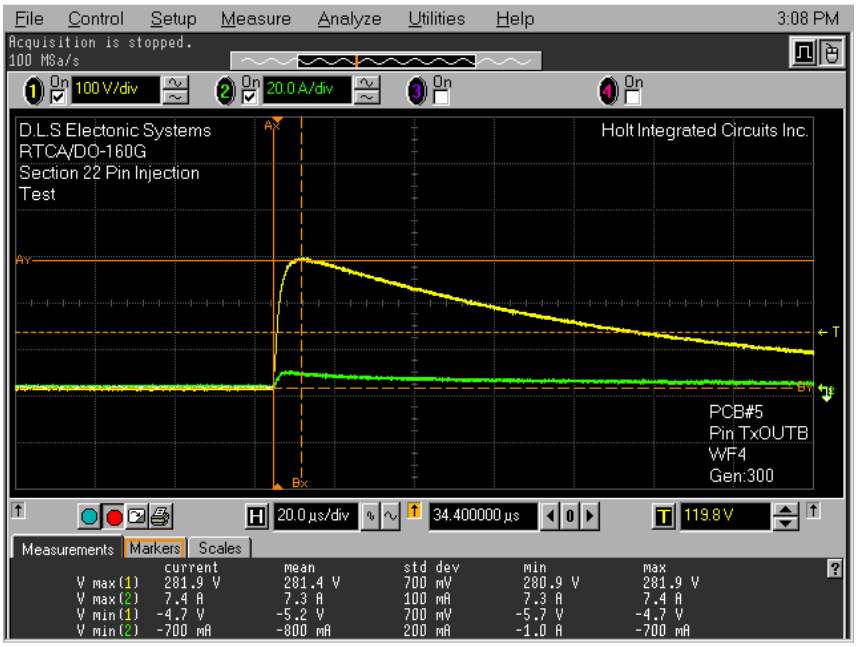

Acquisition
Sampling mode real time Configuration 4GSa/s
Memory depth manual Memory depth 32768pts
Sampling rate automatic Sampling rate 100 MSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 1
Scale 100 V/div Offset 184 V Coupling DC Impedance 1M Ohm
Attenuation 1.000 k : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Channel 2
Scale 20.0 A/div Offset 36.2 A Coupling DC Impedance 1M Ohm
Attenuation 100.0 : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Time base
Scale 20.0 µs/div Position 34.400000 µs Reference center

Trigger
Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 1 Trigger level 119.8 V Slope rising

Measure

	current	mean	std dev	min	max
V max(1)	281.9 V	281.4 V	700 mV	280.9 V	281.9 V
V max(2)	7.4 A	7.3 A	100 mA	7.3 A	7.4 A
V min(1)	-4.7 V	-5.2 V	700 mV	-5.7 V	-4.7 V
V min(2)	-700 mA	-800 mA	200 mA	-1.0 A	-700 mA

Marker

	current	mean	X	Y
V max(1)	281.9 V	281.4 V	A——(1) = -933.5 ns	275.0 V
V max(2)	7.4 A	7.3 A	B---(1) = 6.0665 µs	0.0 V
V min(1)	-4.7 V	-5.2 V	Δ = 7.0000 µs	-275.0 V
V min(2)	-700 mA	-800 mA	1/ΔX = 142.857 kHz	

PIN INJECTION TEST DATA SHEETS

WAVEFORM 5A

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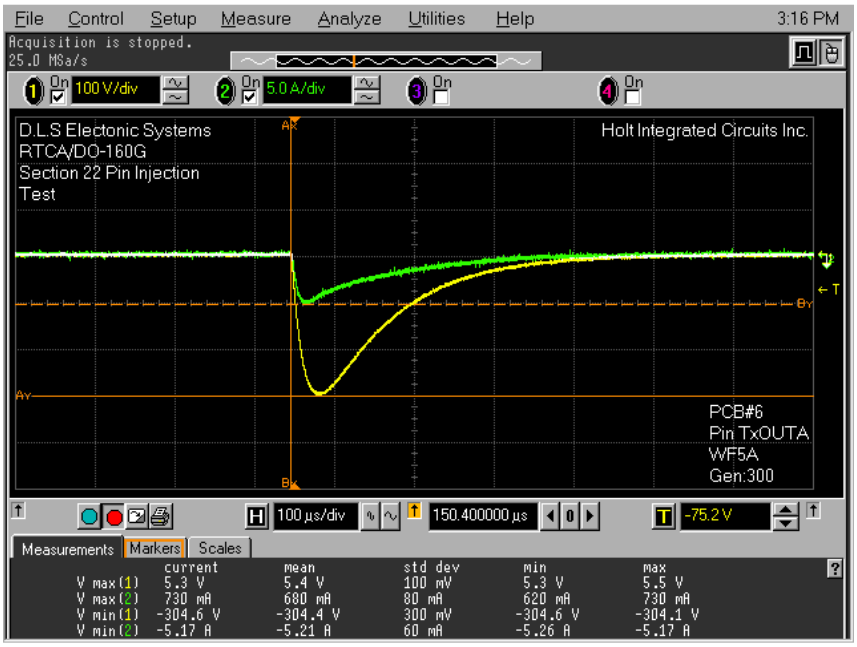

Acquisition
Sampling mode real time Configuration 4GSa/s
Memory depth manual Memory depth 32768pts
Sampling rate automatic Sampling rate 25.0 MSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 1
Scale 100 V/div Offset -105 V Coupling DC Impedance 1M Ohm
Attenuation 1.000 k : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Channel 2
Scale 5.0 A/div Offset -5.10 A Coupling DC Impedance 1M Ohm
Attenuation 100.0 : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Time base
Scale 100 µs/div Position 150.40000 µs Reference center

Trigger
Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 1 Trigger level -75.2 V Slope falling

Measure

	current	mean	std dev	min	max
V max(1)	5.3 V	5.4 V	100 mV	5.3 V	5.5 V
V max(2)	730 mA	680 mA	80 mA	620 mA	730 mA
V min(1)	-304.6 V	-304.4 V	300 mV	-304.6 V	-304.1 V
V min(2)	-5.17 A	-5.21 A	60 mA	-5.26 A	-5.17 A

Marker

	current	mean	X	Y
V max(1)	5.3 V	5.4 V	A——(1) = -4.601 µs	-305.0 V
V max(2)	730 mA	680 mA	B---(2) = -4.601 µs	-5.24 A
V min(1)	-304.6 V	-304.4 V	Δ = 0.0 s	299.76 U
V min(2)	-5.17 A	-5.21 A	1/ΔX = ----------	

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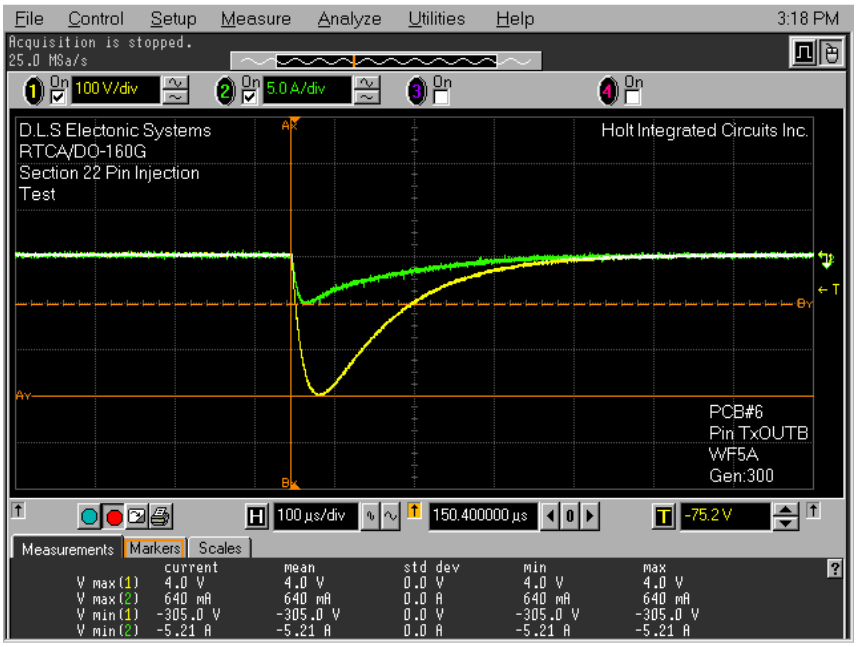

Acquisition
Sampling mode real time Configuration 4GSa/s
Memory depth manual Memory depth 32768pts
Sampling rate automatic Sampling rate 25.0 MSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 1
Scale 100 V/div Offset -105 V Coupling DC Impedance 1M Ohm
Attenuation 1.000 k : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Channel 2
Scale 5.0 A/div Offset -5.10 A Coupling DC Impedance 1M Ohm
Attenuation 100.0 : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Time base
Scale 100 µs/div Position 150.40000 µs Reference center

Trigger
Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 1 Trigger level -75.2 V Slope falling

Measure

	current	mean	std dev	min	max
V max(1)	4.0 V	4.0 V	0.0 V	4.0 V	4.0 V
V max(2)	640 mA	640 mA	0.0 A	640 mA	640 mA
V min(1)	-305.0 V	-305.0 V	0.0 V	-305.0 V	-305.0 V
V min(2)	-5.21 A	-5.21 A	0.0 A	-5.21 A	-5.21 A

Marker

	current	mean	X	Y
V max(1)	4.0 V	4.0 V	A—(1) = -4.601 µs	-305.0 V
V max(2)	640 mA	640 mA	B---(2) = -4.601 µs	-5.24 A
V min(1)	-305.0 V	-305.0 V	Δ = 0.0 s	299.76 U
V min(2)	-5.21 A	-5.21 A	1/ΔX = ----------	

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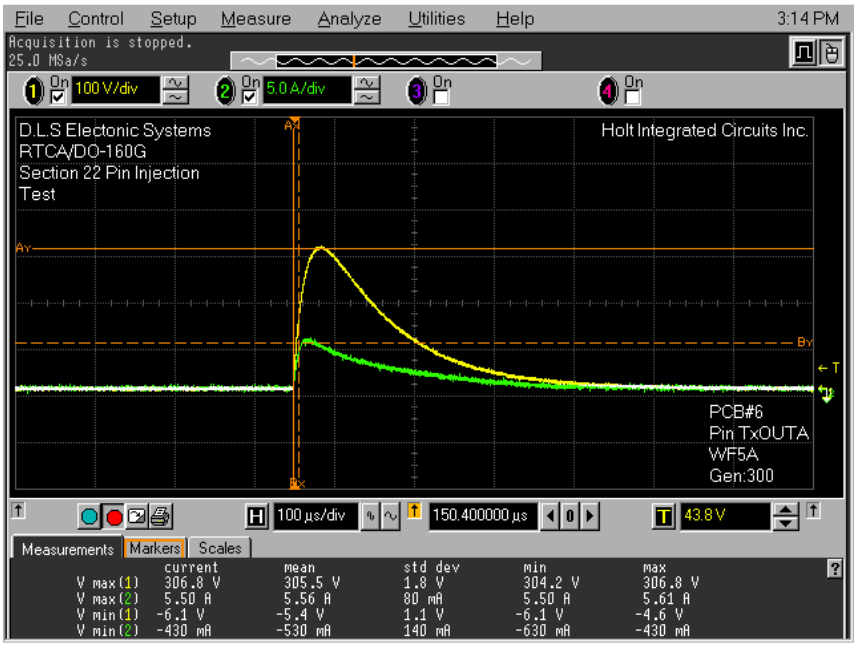

Acquisition
Sampling mode real time Configuration 4GSa/s
Memory depth manual Memory depth 32768pts
Sampling rate automatic Sampling rate 25.0 MSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 1
Scale 100 V/div Offset 184 V Coupling DC Impedance 1M Ohm
Attenuation 1.000 k : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Channel 2
Scale 5.0 A/div Offset 9.25 A Coupling DC Impedance 1M Ohm
Attenuation 100.0 : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Time base
Scale 100 µs/div Position 150.40000 µs Reference center

Trigger
Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 1 Trigger level 43.8 V Slope rising

Measure

	current	mean	std dev	min	max
V max(1)	306.8 V	305.5 V	1.8 V	304.2 V	306.8 V
V max(2)	5.50 A	5.56 A	80 mA	5.50 A	5.61 A
V min(1)	-6.1 V	-5.4 V	1.1 V	-6.1 V	-4.6 V
V min(2)	-430 mA	-530 mA	140 mA	-630 mA	-430 mA

Marker

	current	mean	X	Y
V max(1)	306.8 V	305.5 V	A——(1) = -933.5 ns	300.0 V
V max(2)	5.50 A	5.56 A	B---(2) = 6.0665 µs	4.96 A
V min(1)	-6.1 V	-5.4 V	Δ = 7.0000 µs	-295.04 U
V min(2)	-430 mA	-530 mA	1/ΔX = 142.85714 kHz	

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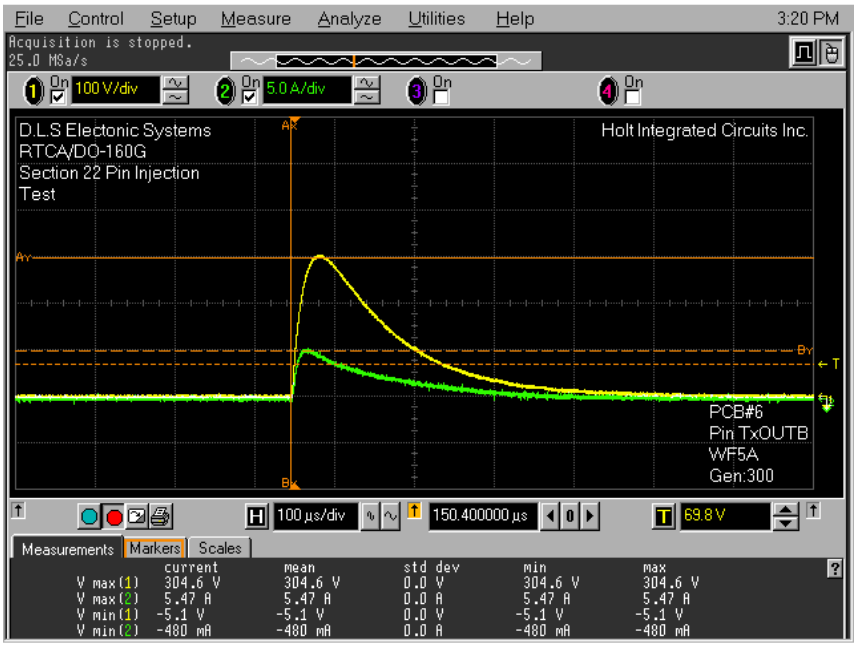

Acquisition
Sampling mode real time Configuration 4GSa/s
Memory depth manual Memory depth 32768pts
Sampling rate automatic Sampling rate 25.0 MSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 1
Scale 100 V/div Offset 201 V Coupling DC Impedance 1M Ohm
Attenuation 1.000 k : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Channel 2
Scale 5.0 A/div Offset 10.35 A Coupling DC Impedance 1M Ohm
Attenuation 100.0 : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Time base
Scale 100 µs/div Position 150.40000 µs Reference center

Trigger
Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 1 Trigger level 69.8 V Slope rising

Measure

	current	mean	std dev	min	max
V max(1)	304.6 V	304.6 V	0.0 V	304.6 V	304.6 V
V max(2)	5.47 A	5.47 A	0.0 A	5.47 A	5.47 A
V min(1)	-5.1 V	-5.1 V	0.0 V	-5.1 V	-5.1 V
V min(2)	-480 mA	-480 mA	0.0 A	-480 mA	-480 mA

Marker

	current	mean	X	Y
V max(1)	304.6 V	304.6 V	A—(1) = -4.601 µs	298.0 V
V max(2)	5.47 A	5.47 A	B---(2) = -4.601 µs	5.21 A
V min(1)	-5.1 V	-5.1 V	Δ = 0.0 s	-292.79 U
V min(2)	-480 mA	-480 mA	1/ΔX = ----------	

PIN INJECTION TEST DATA SHEETS

WAVEFORM 5B

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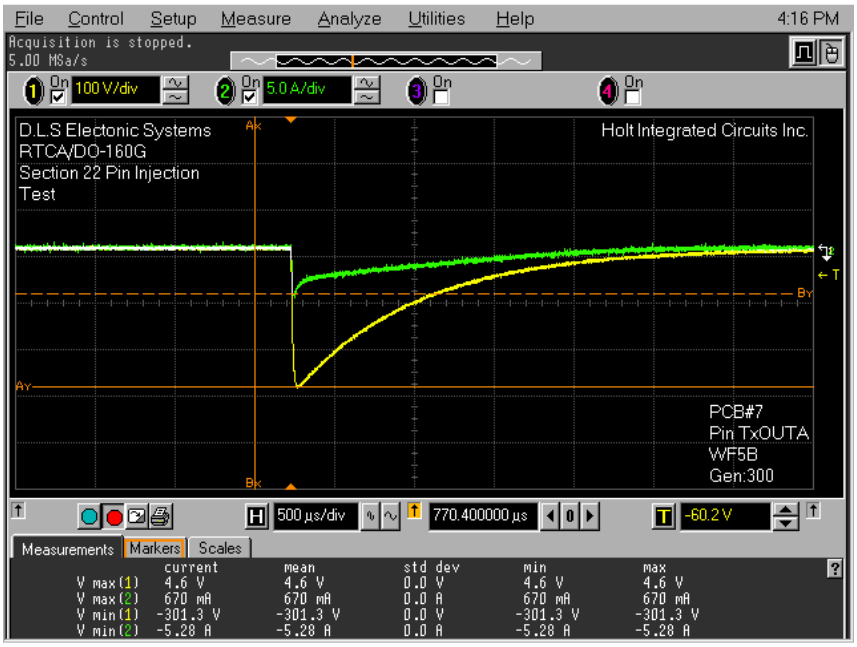

Acquisition
Sampling mode real time Configuration 4GSa/s
Memory depth manual Memory depth 32768pts
Sampling rate automatic Sampling rate 5.00 MSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 1
Scale 100 V/div Offset -119 V Coupling DC Impedance 1M Ohm
Attenuation 1.000 k : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Channel 2
Scale 5.0 A/div Offset -5.95 A Coupling DC Impedance 1M Ohm
Attenuation 100.0 : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Time base
Scale 500 µs/div Position 770.40000 µs Reference center

Trigger
Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 1 Trigger level -60.2 V Slope falling

Measure

	current	mean	std dev	min	max
V max(1)	4.6 V	4.6 V	0.0 V	4.6 V	4.6 V
V max(2)	670 mA	670 mA	0.0 A	670 mA	670 mA
V min(1)	-301.3 V	-301.3 V	0.0 V	-301.3 V	-301.3 V
V min(2)	-5.28 A	-5.28 A	0.0 A	-5.28 A	-5.28 A

Marker

	current	mean	X	Y
V max(1)	4.6 V	4.6 V	A—(1) = -229.605 µs	-300.0 V
V max(2)	670 mA	670 mA	B---(2) = -229.605 µs	-5.00 A
V min(1)	-301.3 V	-301.3 V	Δ = 0.0 s	295.00 V
V min(2)	-5.28 A	-5.28 A	1/ΔX = ----------	

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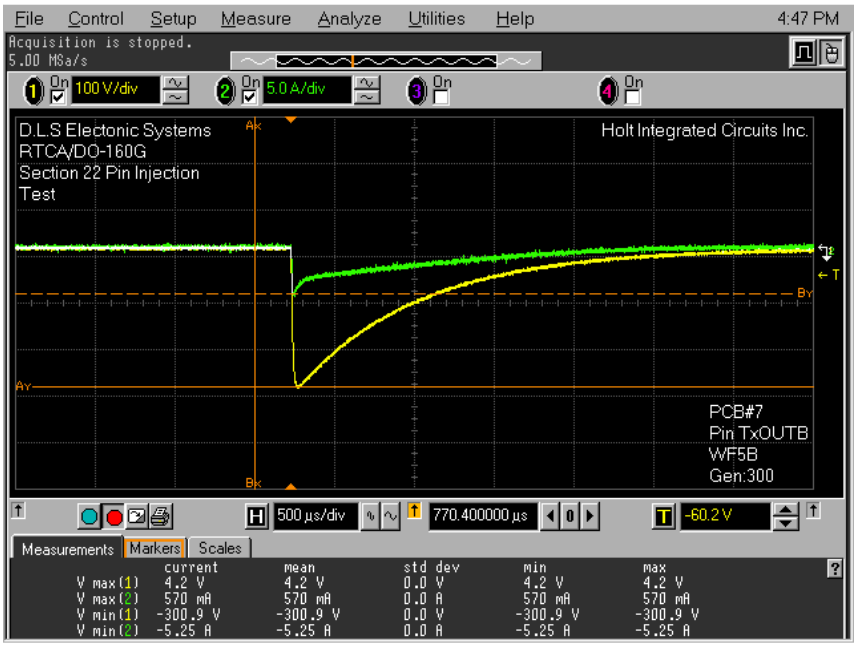

Acquisition
Sampling mode real time Configuration 4GSa/s
Memory depth manual Memory depth 32768pts
Sampling rate automatic Sampling rate 5.00 MSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 1
Scale 100 V/div Offset -119 V Coupling DC Impedance 1M Ohm
Attenuation 1.000 k : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Channel 2
Scale 5.0 A/div Offset -5.95 A Coupling DC Impedance 1M Ohm
Attenuation 100.0 : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Time base
Scale 500 µs/div Position 770.40000 µs Reference center

Trigger
Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 1 Trigger level -60.2 V Slope falling

Measure

	current	mean	std dev	min	max
V max(1)	4.2 V	4.2 V	0.0 V	4.2 V	4.2 V
V max(2)	570 mA	570 mA	0.0 A	570 mA	570 mA
V min(1)	-300.9 V	-300.9 V	0.0 V	-300.9 V	-300.9 V
V min(2)	-5.25 A	-5.25 A	0.0 A	-5.25 A	-5.25 A

Marker

	current	mean	X	Y
V max(1)	4.2 V	4.2 V	A——(1) = -229.605 µs	-300.0 V
V max(2)	570 mA	570 mA	B---(2) = -229.605 µs	-5.00 A
V min(1)	-300.9 V	-300.9 V	Δ = 0.0 s	295.00 U
V min(2)	-5.25 A	-5.25 A	1/ΔX = ----------	

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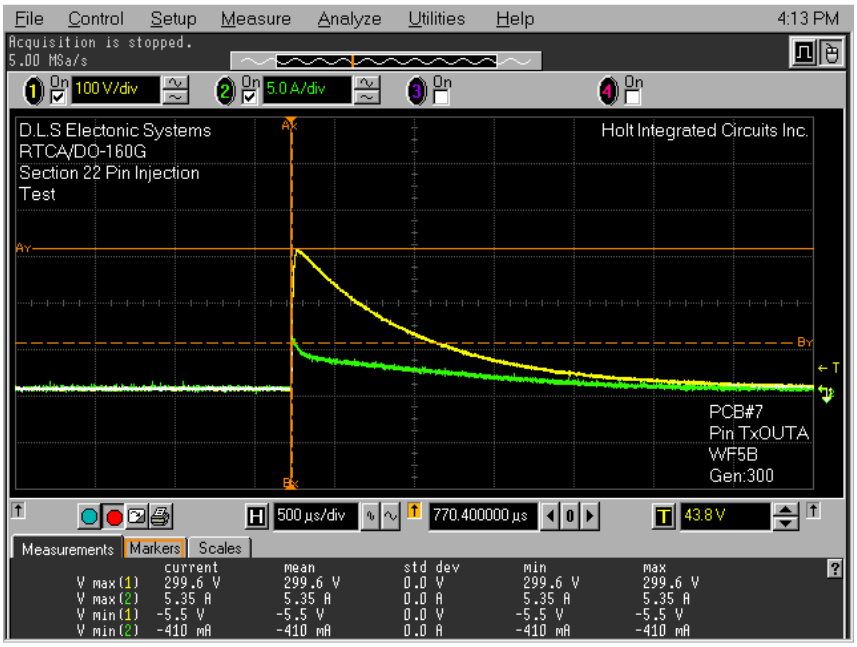

Acquisition
Sampling mode real time Configuration 4GSa/s
Memory depth manual Memory depth 32768pts
Sampling rate automatic Sampling rate 5.00 MSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 1
Scale 100 V/div Offset 184 V Coupling DC Impedance 1M Ohm
Attenuation 1.000 k : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Channel 2
Scale 5.0 A/div Offset 9.25 A Coupling DC Impedance 1M Ohm
Attenuation 100.0 : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Time base
Scale 500 µs/div Position 770.40000 µs Reference center

Trigger
Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 1 Trigger level 43.8 V Slope rising

Measure

	current	mean	std dev	min	max
V max(1)	299.6 V	299.6 V	0.0 V	299.6 V	299.6 V
V max(2)	5.35 A	5.35 A	0.0 A	5.35 A	5.35 A
V min(1)	-5.5 V	-5.5 V	0.0 V	-5.5 V	-5.5 V
V min(2)	-410 mA	-410 mA	0.0 A	-410 mA	-410 mA

Marker

	current	mean	X	Y
V max(1)	299.6 V	299.6 V	A——(1) = -934 ns	300 V
V max(2)	5.35 A	5.35 A	B---(2) = 6.066 µs	4.96 A
V min(1)	-5.5 V	-5.5 V	Δ = 7.000 µs	-295.04 U
V min(2)	-410 mA	-410 mA	1/ΔX = 142.85714 kHz	

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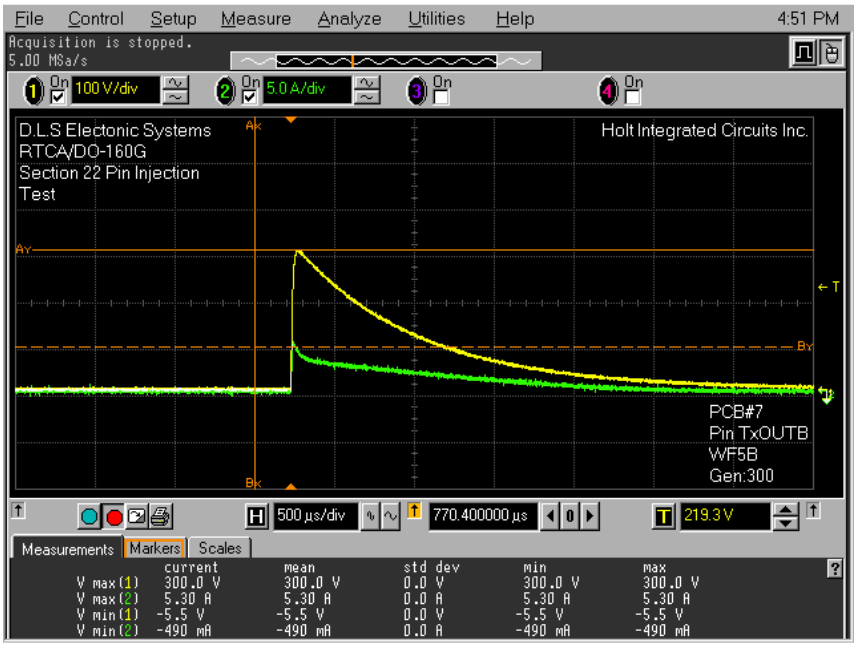

Acquisition
Sampling mode real time Configuration 4GSa/s
Memory depth manual Memory depth 32768pts
Sampling rate automatic Sampling rate 5.00 MSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 1
Scale 100 V/div Offset 185 V Coupling DC Impedance 1M Ohm
Attenuation 1.000 k : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Channel 2
Scale 5.0 A/div Offset 9.50 A Coupling DC Impedance 1M Ohm
Attenuation 100.0 : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Time base
Scale 500 µs/div Position 770.40000 µs Reference center

Trigger
Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 1 Trigger level 219.3 V Slope rising

Measure

	current	mean	std dev	min	max
V max(1)	300.0 V	300.0 V	0.0 V	300.0 V	300.0 V
V max(2)	5.30 A	5.30 A	0.0 A	5.30 A	5.30 A
V min(1)	-5.5 V	-5.5 V	0.0 V	-5.5 V	-5.5 V
V min(2)	-490 mA	-490 mA	0.0 A	-490 mA	-490 mA

Marker

	current	mean	X	Y
V max(1)	300.0 V	300.0 V	A—(1) = -229.605 µs	300.0 V
V max(2)	5.30 A	5.30 A	B---(2) = -229.605 µs	4.79 A
V min(1)	-5.5 V	-5.5 V	Δ = 0.0 s	-295.21 U
V min(2)	-490 mA	-490 mA	1/ΔX = ----------	

PIN INJECTION

WAVEFORM 3 CALIBRATION DATA SHEETS

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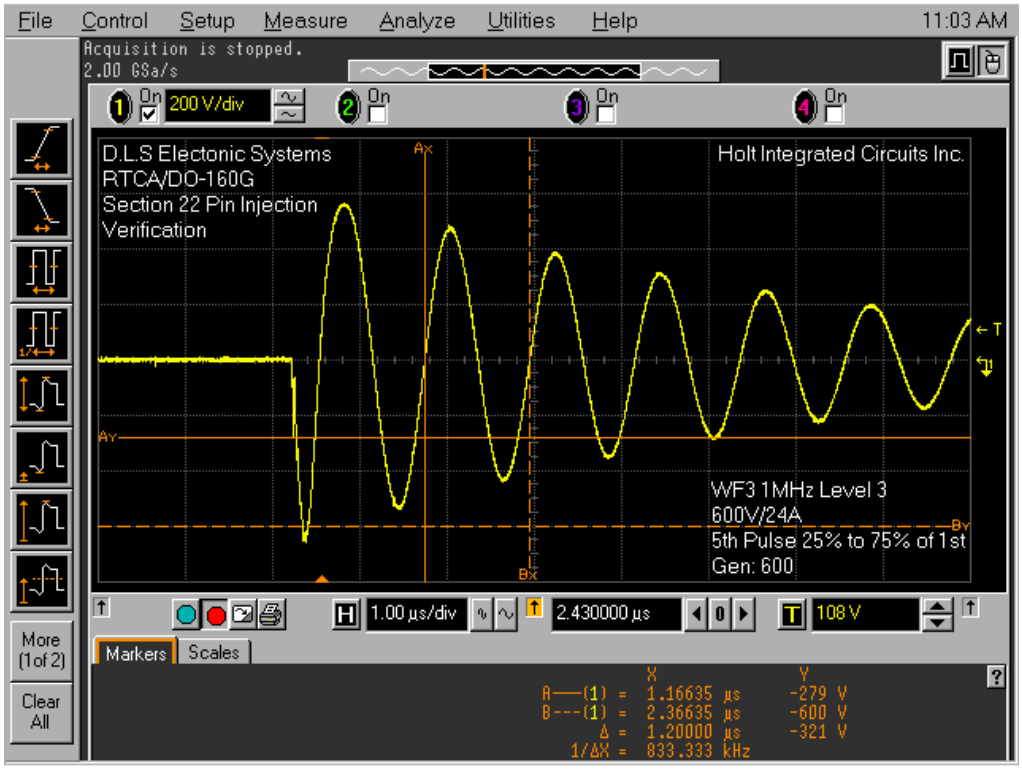

Acquisition
Sampling mode real time Configuration 4GSa/s
Memory depth manual Memory depth 32768pts
Sampling rate automatic Sampling rate 2.00 GSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 1
Scale 200 V/div Offset 0 V Coupling DC Impedance 1M Ohm
Attenuation 1.000 k : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Time base
Scale 1.00 µs/div Position 2.430000 µs Reference center

Trigger
Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 1 Trigger level 108 V Slope rising

Marker

	X	Y
A——(1) =	1.16635 µs	-279 V
B---(1) =	2.36635 µs	-600 V
Δ =	1.20000 µs	-321 V
1/ΔX =	833.333 kHz	

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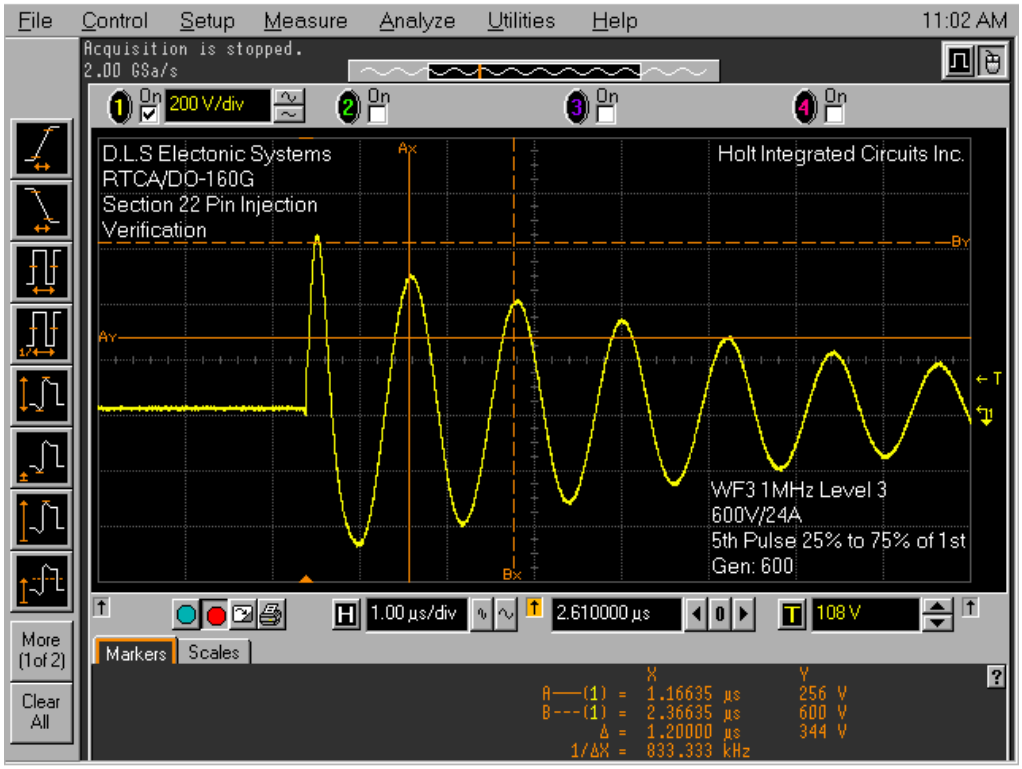

Acquisition	Sampling mode real time Configuration 4GSa/s Memory depth manual Memory depth 32768pts Sampling rate automatic Sampling rate 2.00 GSa/s Averaging off 9-bit BW Filter off Interpolation on
Channel 1	Scale 200 V/div Offset 176 V Coupling DC Impedance 1M Ohm Attenuation 1.000 k : 1 Atten units ratio Skew 0.0 s Ext adapter None Ext coupler None Ext gain 1.00E+00 Ext offset 0.0E+00
Time base	Scale 1.00 µs/div Position 2.610000 µs Reference center
Trigger	Mode edge Sweep triggered Hysteresis normal Holdoff time 60 ns Coupling DC Source channel 1 Trigger level 108 V Slope rising

Marker

	X	Y
A—(1) =	1.16635 µs	256 V
B---(1) =	2.36635 µs	600 V
Δ =	1.20000 µs	344 V
1/ΔX =	833.333 kHz	

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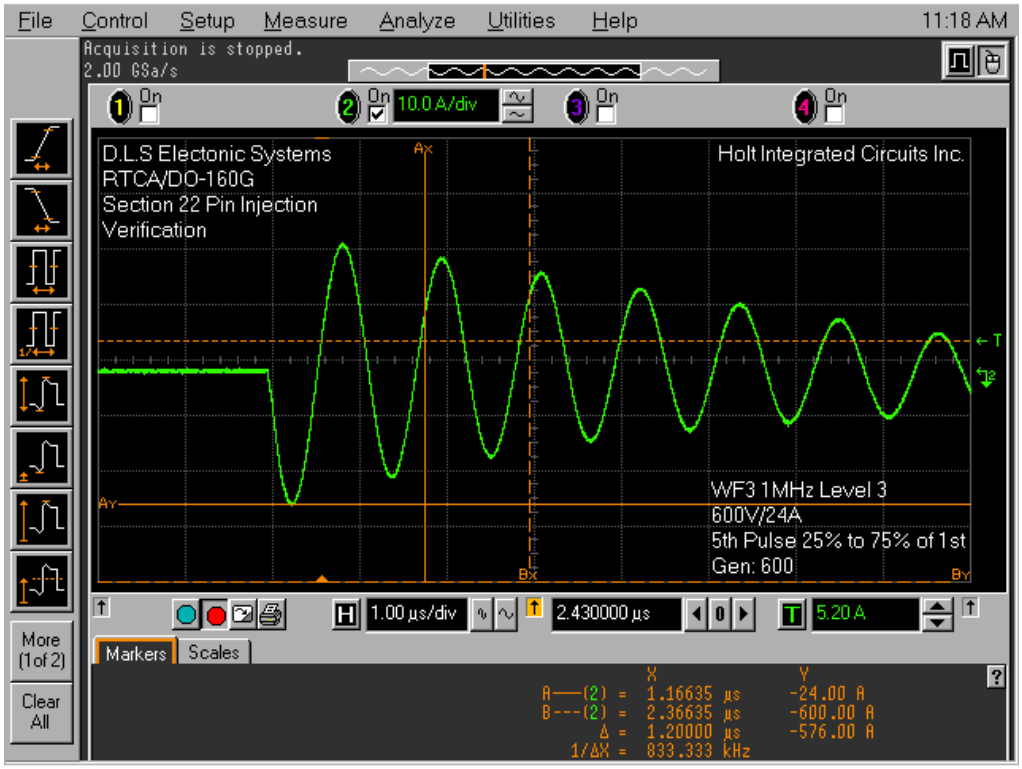

Acquisition
Sampling mode real time Configuration 4GSa/s
Memory depth manual Memory depth 32768pts
Sampling rate automatic Sampling rate 2.00 GSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 2
Scale 10.0 A/div Offset 1.9 A Coupling DC Impedance 1M Ohm
Attenuation 100.0 : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Time base
Scale 1.00 µs/div Position 2.430000 µs Reference center

Trigger
Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 2 Trigger level 5.20 A Slope rising

Marker

	X	Y
A——(2) =	1.16635 µs	-24.00 A
B---(2) =	2.36635 µs	-600.00 A
Δ =	1.20000 µs	-576.00 A
1/ΔX =	833.333 kHz	

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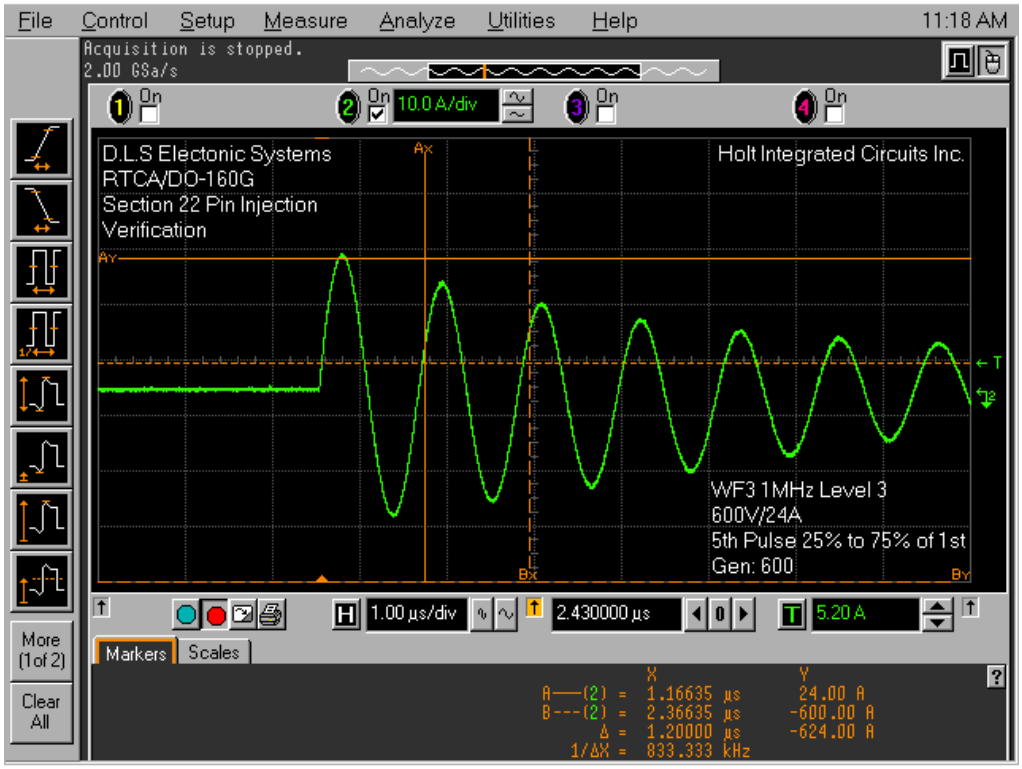

Acquisition
Sampling mode real time Configuration 4GSa/s
Memory depth manual Memory depth 32768pts
Sampling rate automatic Sampling rate 2.00 GSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 2
Scale 10.0 A/div Offset 5.8 A Coupling DC Impedance 1M Ohm
Attenuation 100.0 : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Time base
Scale 1.00 µs/div Position 2.430000 µs Reference center

Trigger
Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 2 Trigger level 5.20 A Slope rising

Marker

	X	Y
A——(2) =	1.16635 µs	24.00 A
B---(2) =	2.36635 µs	-600.00 A
Δ =	1.20000 µs	-624.00 A
1/ΔX =	833.333 kHz	

PIN INJECTION

WAVEFORM 4 CALIBRATION DATA SHEETS

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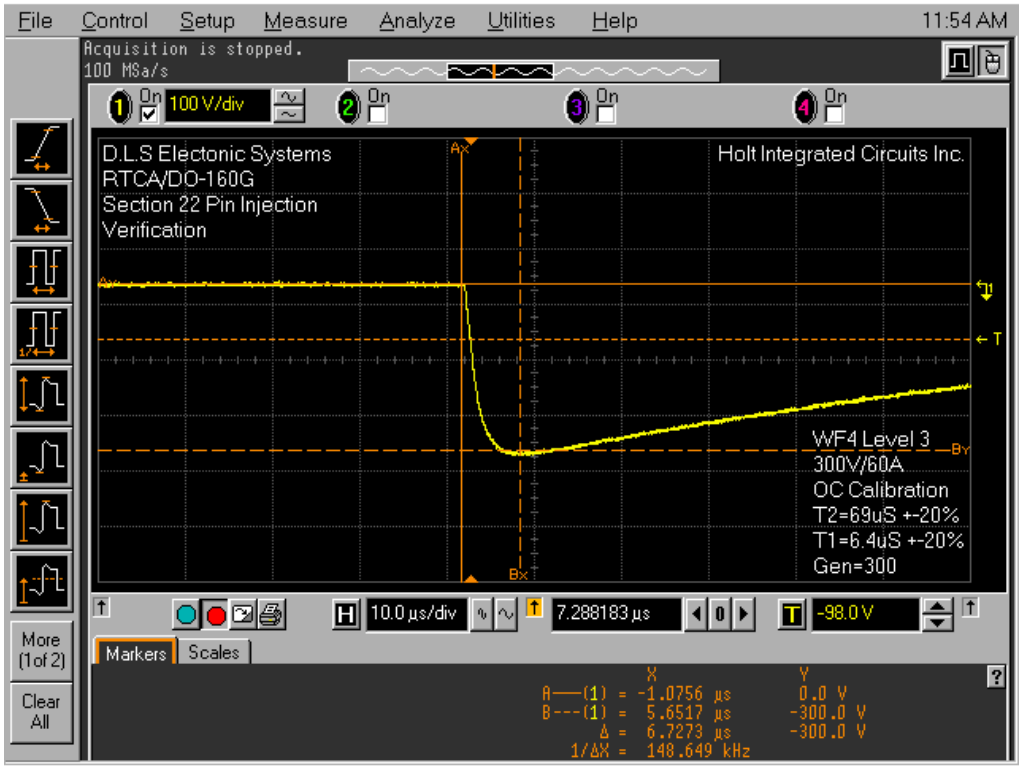

Acquisition	Sampling mode real time Configuration 4GSa/s Memory depth manual Memory depth 32768pts Sampling rate automatic Sampling rate 250 MSa/s Averaging off 9-bit BW Filter off Interpolation on
Channel 1	Scale 100 V/div Offset -136 V Coupling DC Impedance 1M Ohm Attenuation 1.000 k : 1 Atten units ratio Skew 0.0 s Ext adapter None Ext coupler None Ext gain 1.00E+00 Ext offset 0.0E+00
Time base	Scale 10.0 µs/div Position 7.288183 µs Reference center
Trigger	Mode edge Sweep triggered Hysteresis normal Holdoff time 60 ns Coupling DC Source channel 1 Trigger level -98.0 V Slope falling

Marker

	X	Y
A——(1) =	-1.0756 µs	0.0 V
B---(1) =	5.6517 µs	-300.0 V
Δ =	6.7273 µs	-300.0 V
1/ΔX =	148.649 kHz	

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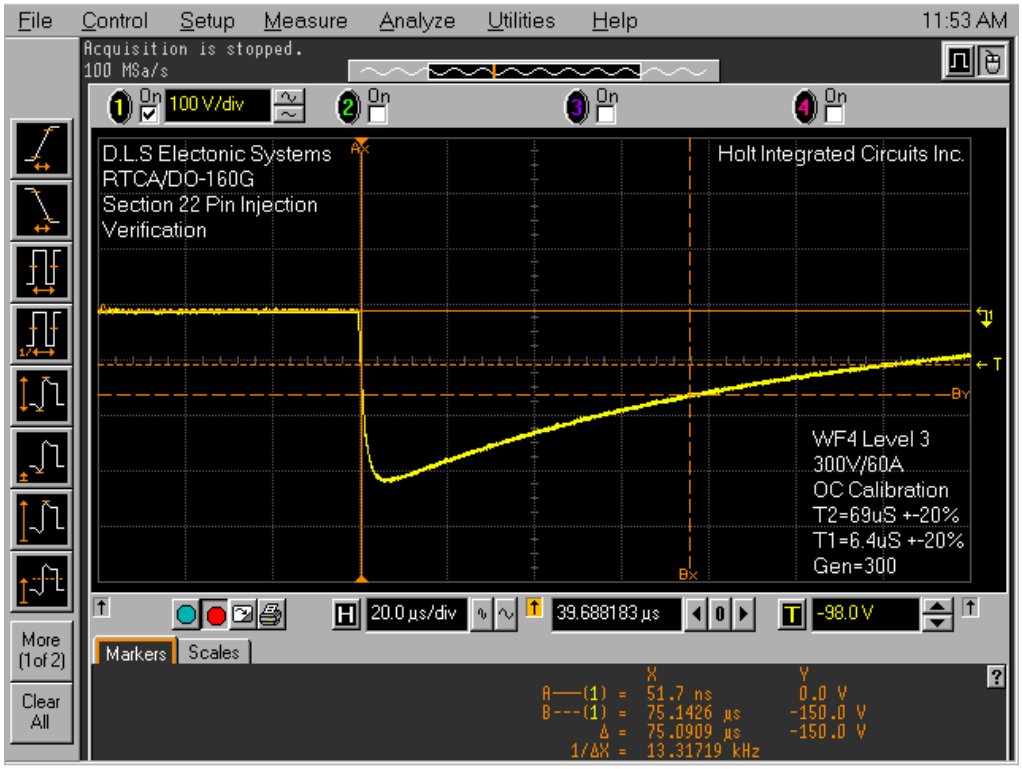

Acquisition Sampling mode real time Configuration 4GSa/s
Memory depth manual Memory depth 32768pts
Sampling rate automatic Sampling rate 100 MSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 1 Scale 100 V/div Offset -88 V Coupling DC Impedance 1M Ohm
Attenuation 1.000 k : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Time base Scale 20.0 µs/div Position 39.688183 µs Reference center

Trigger Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 1 Trigger level -98.0 V Slope falling

Marker

	X	Y
A—(1) =	51.7 ns	0.0 V
B---(1) =	75.1426 µs	-150.0 V
Δ =	75.0909 µs	-150.0 V
1/ΔX =	13.31719 kHz	

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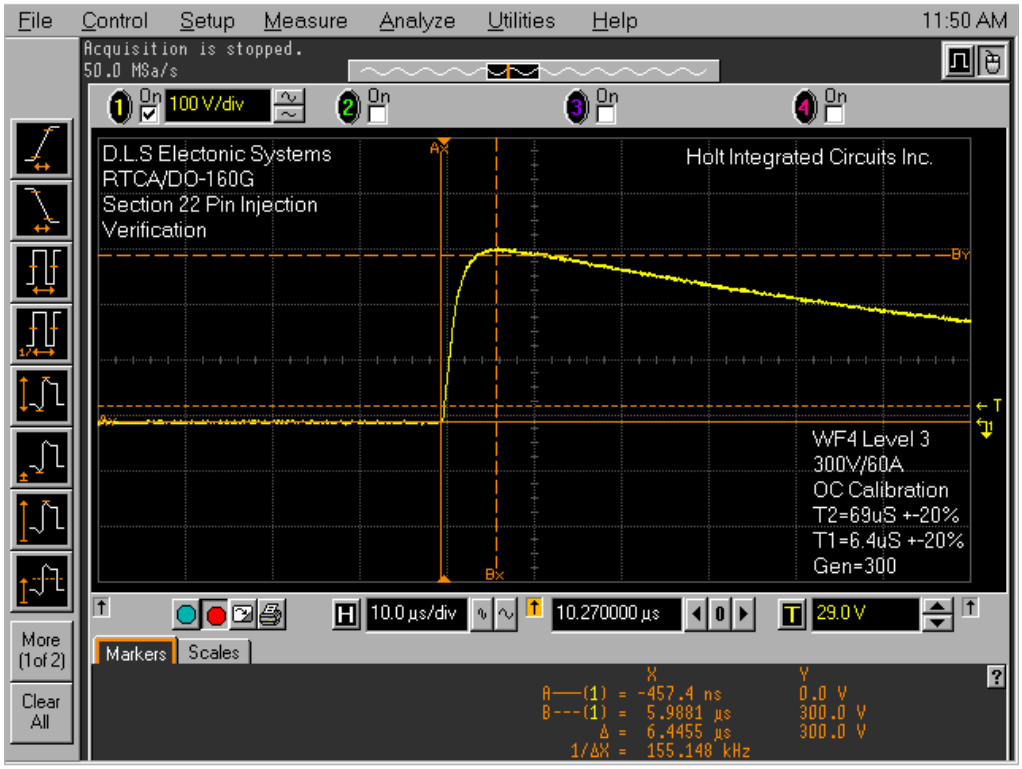

Acquisition Sampling mode real time Configuration 4GSa/s
Memory depth manual Memory depth 32768pts
Sampling rate automatic Sampling rate 250 MSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 1 Scale 100 V/div Offset 112 V Coupling DC Impedance 1M Ohm
Attenuation 1.000 k : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Time base Scale 10.0 µs/div Position 10.270000 µs Reference center

Trigger Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 1 Trigger level 29.0 V Slope rising

Marker

	X	Y
A——(1) =	-457.4 ns	0.0 V
B---(1) =	5.9881 µs	300.0 V
Δ =	6.4455 µs	300.0 V
1/ΔX =	155.148 kHz	

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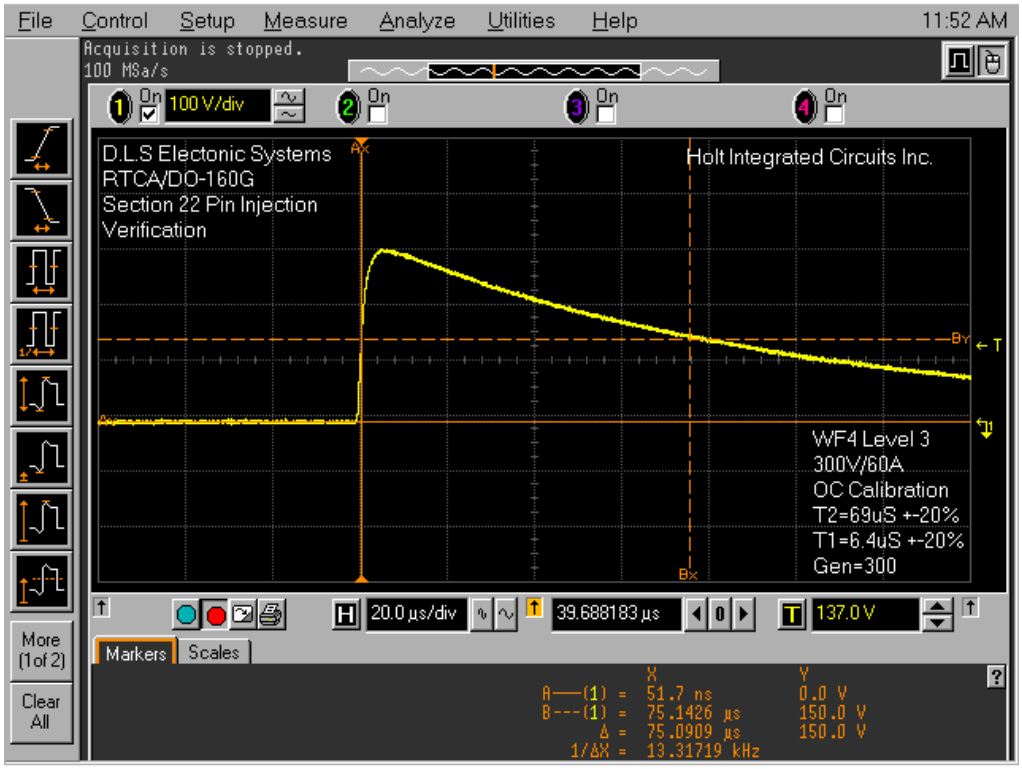

Acquisition
Sampling mode real time Configuration 4GSa/s
Memory depth manual Memory depth 32768pts
Sampling rate automatic Sampling rate 100 MSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 1
Scale 100 V/div Offset 112 V Coupling DC Impedance 1M Ohm
Attenuation 1.000 k : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Time base
Scale 20.0 µs/div Position 39.688183 µs Reference center

Trigger
Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 1 Trigger level 137.0 V Slope rising

Marker

	X	Y
A——(1) =	51.7 ns	0.0 V
B---(1) =	75.1426 µs	150.0 V
Δ =	75.0909 µs	150.0 V
1/ΔX =	13.31719 kHz	

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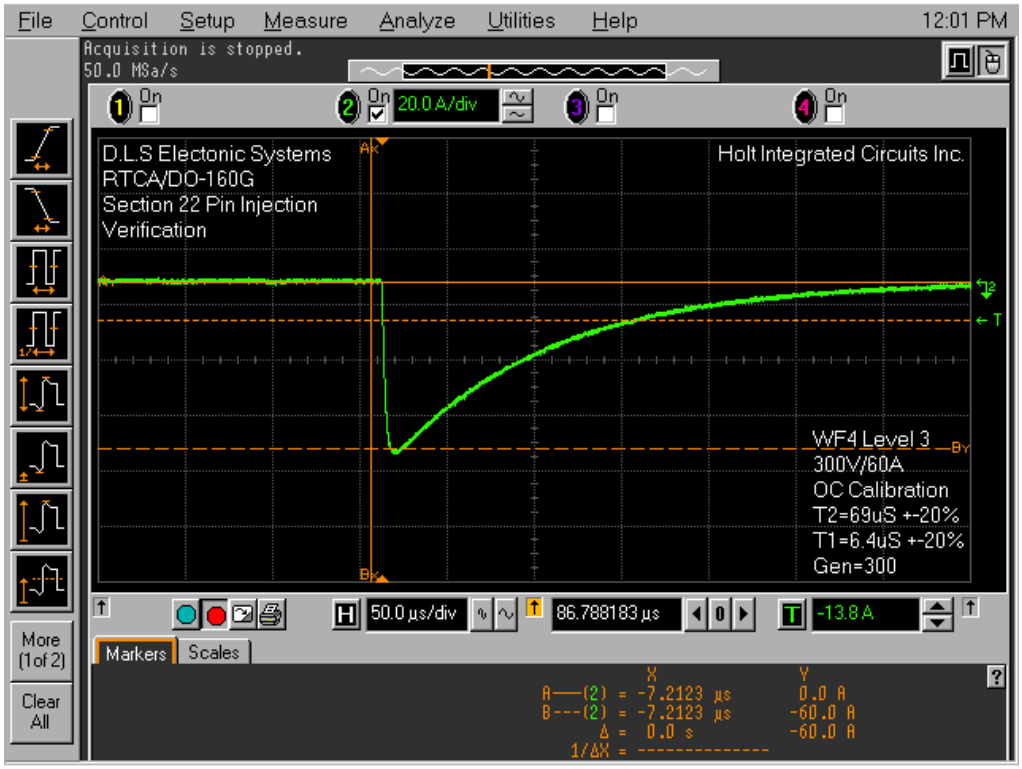

Acquisition	Sampling mode real time Configuration 4GSa/s Memory depth manual Memory depth 32768pts Sampling rate automatic Sampling rate 50.0 MSa/s Averaging off 9-bit BW Filter off Interpolation on
Channel 2	Scale 20.0 A/div Offset -28.0 A Coupling DC Impedance 1M Ohm Attenuation 100.0 : 1 Atten units ratio Skew 0.0 s Ext adapter None Ext coupler None Ext gain 1.00E+00 Ext offset 0.0E+00
Time base	Scale 50.0 µs/div Position 86.788183 µs Reference center
Trigger	Mode edge Sweep triggered Hysteresis normal Holdoff time 60 ns Coupling DC Source channel 2 Trigger level -13.8 A Slope falling

Marker

	X	Y
A——(2) =	-7.2123 µs	0.0 A
B---(2) =	-7.2123 µs	-60.0 A
Δ =	0.0 s	-60.0 A
1/ΔX =	----------	

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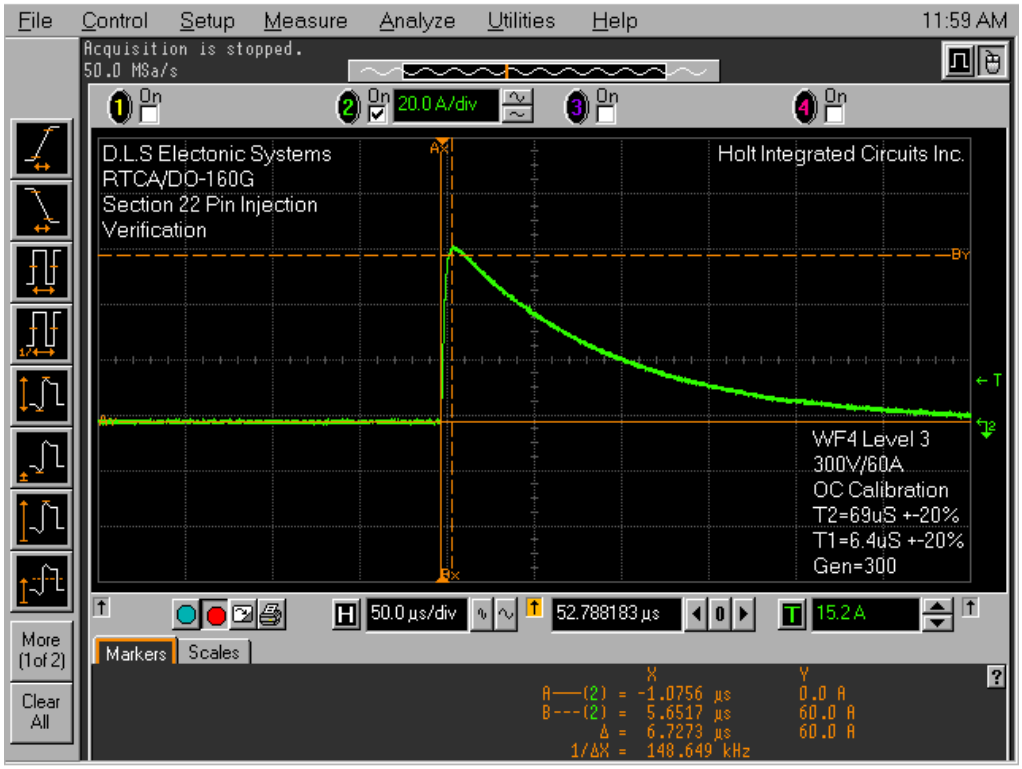

Acquisition Sampling mode real time Configuration 4GSa/s
Memory depth manual Memory depth 32768pts
Sampling rate automatic Sampling rate 50.0 MSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 2 Scale 20.0 A/div Offset 22.4 A Coupling DC Impedance 1M Ohm
Attenuation 100.0 : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Time base Scale 50.0 µs/div Position 52.788183 µs Reference center

Trigger Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 2 Trigger level 15.2 A Slope rising

Marker

	X	Y
A——(2) =	-1.0756 µs	0.0 A
B---(2) =	5.6517 µs	60.0 A
Δ =	6.7273 µs	60.0 A
1/ΔX =	148.649 kHz	

PIN INJECTION

WAVEFORM 5A CALIBRATION DATA SHEETS

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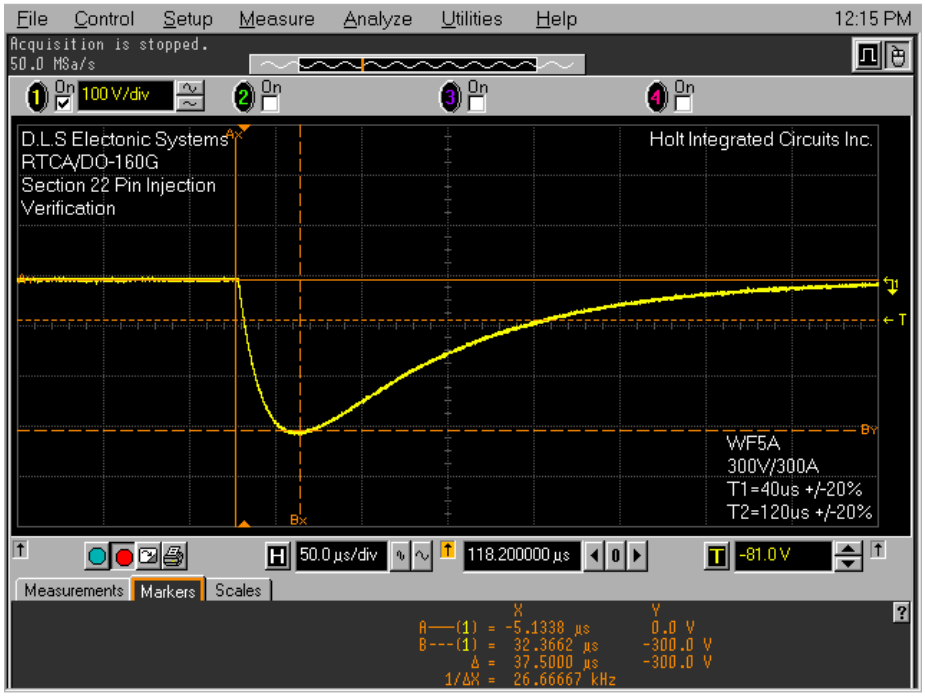

Acquisition
Sampling mode real time Configuration 4GSa/s
Memory depth manual Memory depth 32768pts
Sampling rate automatic Sampling rate 50.0 MSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 1
Scale 100 V/div Offset -92 V Coupling DC Impedance 1M Ohm
Attenuation 1.000 k : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Time base
Scale 50.0 µs/div Position 118.20000 µs Reference center

Trigger
Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 1 Trigger level -81.0 V Slope falling

Measure

	current	mean	std dev	min	max
V max(1)	5.7 V	5.3 V	700 mV	4.8 V	5.7 V
V min(1)	-308.8 V	-308.3 V	800 mV	-308.8 V	-307.7 V
V max(2)	Source off				
V min(2)	Source off				

Marker

	current	mean	X	Y
V max(1)	5.7 V	5.3 V	A—(1) = -5.1338 µs	0.0 V
V min(1)	-308.8 V	-308.3 V	B---(1) = 32.3662 µs	-300.0 V
V max(2)	Source off		Δ = 37.5000 µs	-300.0 V
V min(2)	Source off		1/ΔX = 26.66667 kHz	

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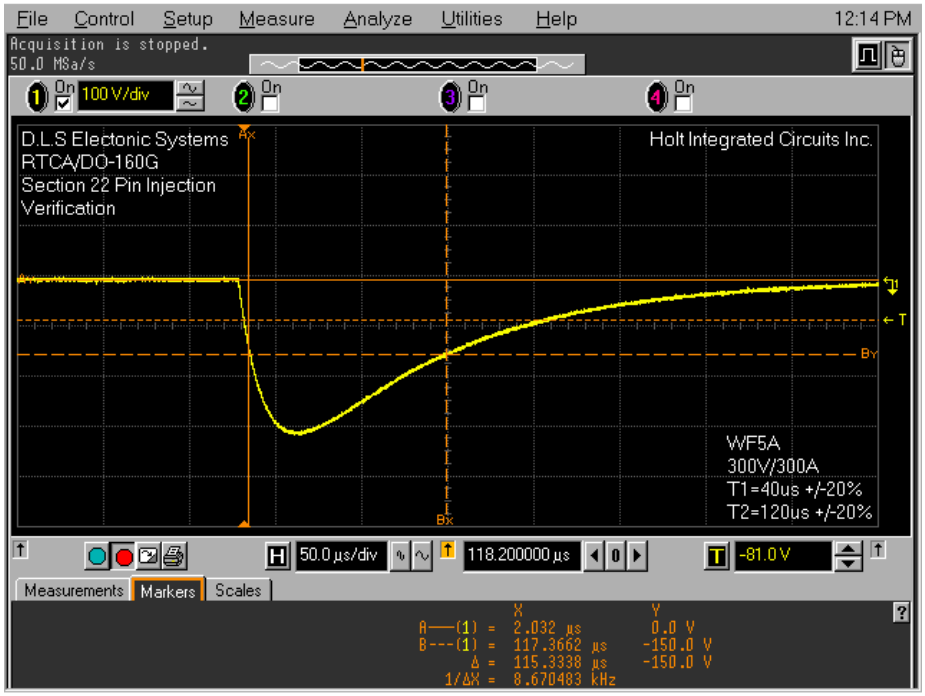

Acquisition
Sampling mode real time Configuration 4GSa/s
Memory depth manual Memory depth 32768pts
Sampling rate automatic Sampling rate 50.0 MSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 1
Scale 100 V/div Offset -92 V Coupling DC Impedance 1M Ohm
Attenuation 1.000 k : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Time base
Scale 50.0 µs/div Position 118.20000 µs Reference center

Trigger
Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 1 Trigger level -81.0 V Slope falling

Measure

	current	mean	std dev	min	max
V max(1)	5.7 V	5.3 V	700 mV	4.8 V	5.7 V
V min(1)	-308.8 V	-308.3 V	800 mV	-308.8 V	-307.7 V
V max(2)	Source off				
V min(2)	Source off				

Marker

	current	mean		X	Y
V max(1)	5.7 V	5.3 V	A——(1) =	2.032 µs	0.0 V
V min(1)	-308.8 V	-308.3 V	B---(1) =	117.3662 µs	-150.0 V
V max(2)	Source off		Δ =	115.3338 µs	-150.0 V
V min(2)	Source off		1/ΔX =	8.670483 kHz	

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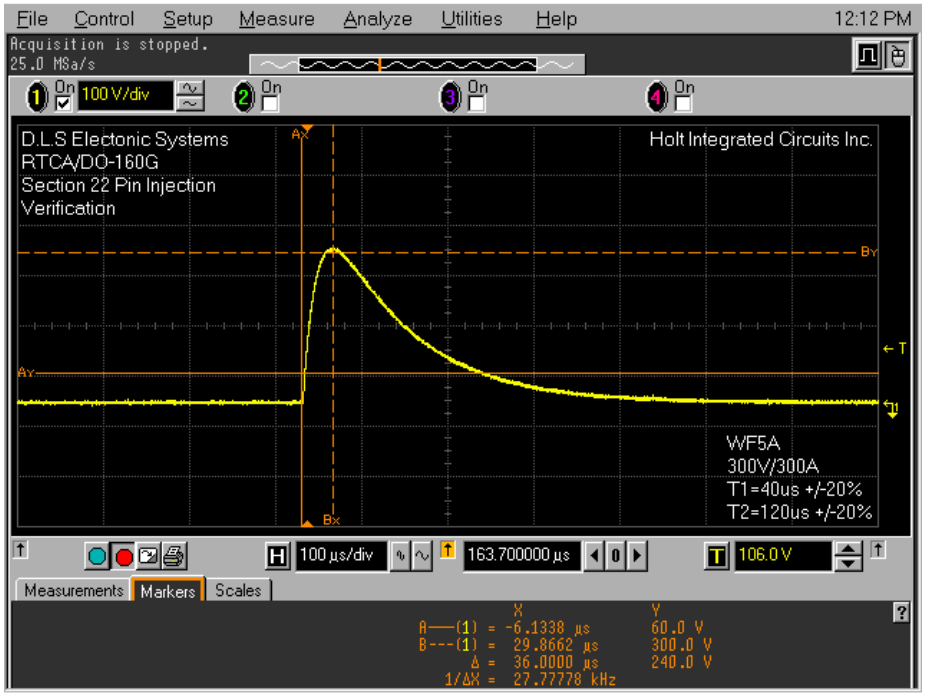

Acquisition
Sampling mode real time Configuration 4GSa/s
Memory depth manual Memory depth 32768pts
Sampling rate automatic Sampling rate 25.0 MSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 1
Scale 100 V/div Offset 153 V Coupling DC Impedance 1M Ohm
Attenuation 1.000 k : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Time base
Scale 100 µs/div Position 163.70000 µs Reference center

Trigger
Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 1 Trigger level 106.0 V Slope rising

Measure

	current	mean	std dev	min	max
V max(1)	308.4 V	307.9 V	800 mV	307.4 V	308.4 V
V min(1)	-5.2 V	-4.5 V	1.0 V	-5.2 V	-3.8 V
V max(2)	Source off	---	---	---	---
V min(2)	Source off	---	---	---	---

Marker

	current	mean	X	Y
V max(1)	308.4 V	307.9 V	A—(1) = -6.1338 µs	60.0 V
V min(1)	-5.2 V	-4.5 V	B---(1) = 29.8662 µs	300.0 V
V max(2)	Source off	---	Δ = 36.0000 µs	240.0 V
V min(2)	Source off	---	1/ΔX = 27.77778 kHz	

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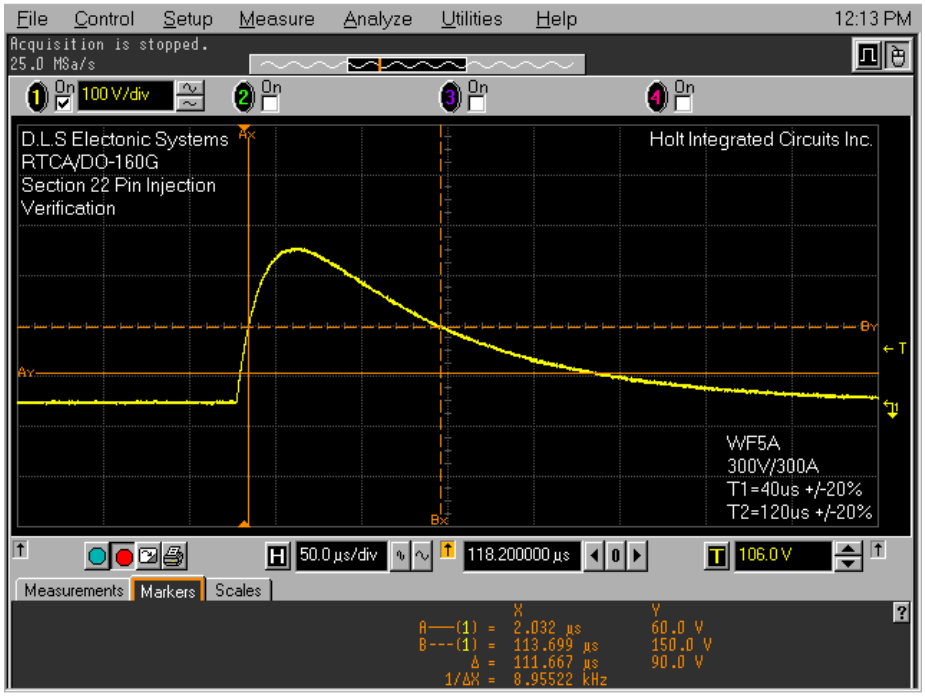

Acquisition
Sampling mode real time Configuration 4GSa/s
Memory depth manual Memory depth 32768pts
Sampling rate automatic Sampling rate 50.0 MSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 1
Scale 100 V/div Offset 153 V Coupling DC Impedance 1M Ohm
Attenuation 1.000 k : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Time base
Scale 50.0 µs/div Position 118.20000 µs Reference center

Trigger
Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 1 Trigger level 106.0 V Slope rising

Measure

	current	mean	std dev	min	max
V max(1)	308.4 V	308.4 V	0.0 V	308.4 V	308.4 V
V min(1)	-5.1 V	-5.1 V	0.0 V	-5.1 V	-5.1 V
V max(2)	Source off	---	---	---	---
V min(2)	Source off	---	---	---	---

Marker

	current	mean		X	Y
V max(1)	308.4 V	308.4 V	A—(1) =	2.032 µs	60.0 V
V min(1)	-5.1 V	-5.1 V	B---(1) =	113.699 µs	150.0 V
V max(2)	Source off	---	Δ =	111.667 µs	90.0 V
V min(2)	Source off	---	1/ΔX =	8.95522 kHz	

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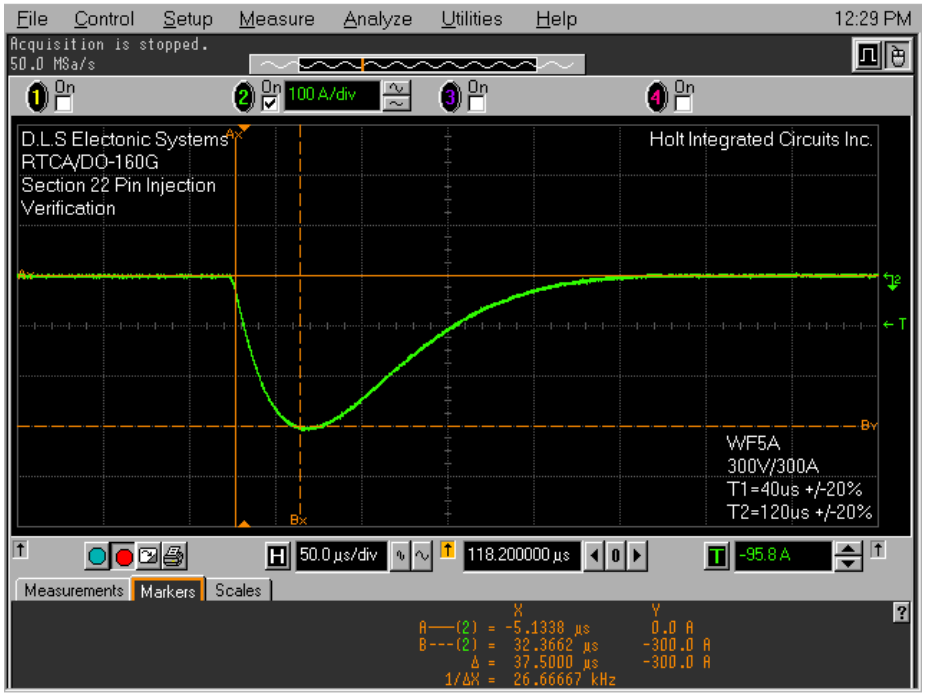

Acquisition
Sampling mode real time Configuration 4GSa/s
Memory depth manual Memory depth 32768pts
Sampling rate automatic Sampling rate 50.0 MSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 2
Scale 100 A/div Offset -98.6 A Coupling DC Impedance 1M Ohm
Attenuation 100.0 : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Time base
Scale 50.0 µs/div Position 118.20000 µs Reference center

Trigger
Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 2 Trigger level -95.8 A Slope falling

Measure

	current	mean	std dev	min	max
V max(1)	Source off	----------	----------	----------	----------
V min(1)	Source off	----------	----------	----------	----------
V max(2)	6.7 A	6.7 A	0.0 A	6.7 A	6.7 A
V min(2)	-306.5 A	-306.5 A	0.0 A	-306.5 A	-306.5 A

Marker

	current	mean	X	Y
V max(1)	Source off	----------	A——(2) = -5.1338 µs	0.0 A
V min(1)	Source off	----------	B---(2) = 32.3662 µs	-300.0 A
V max(2)	6.7 A	6.7 A	Δ = 37.5000 µs	-300.0 A
V min(2)	-306.5 A	-306.5 A	1/ΔX = 26.66667 kHz	

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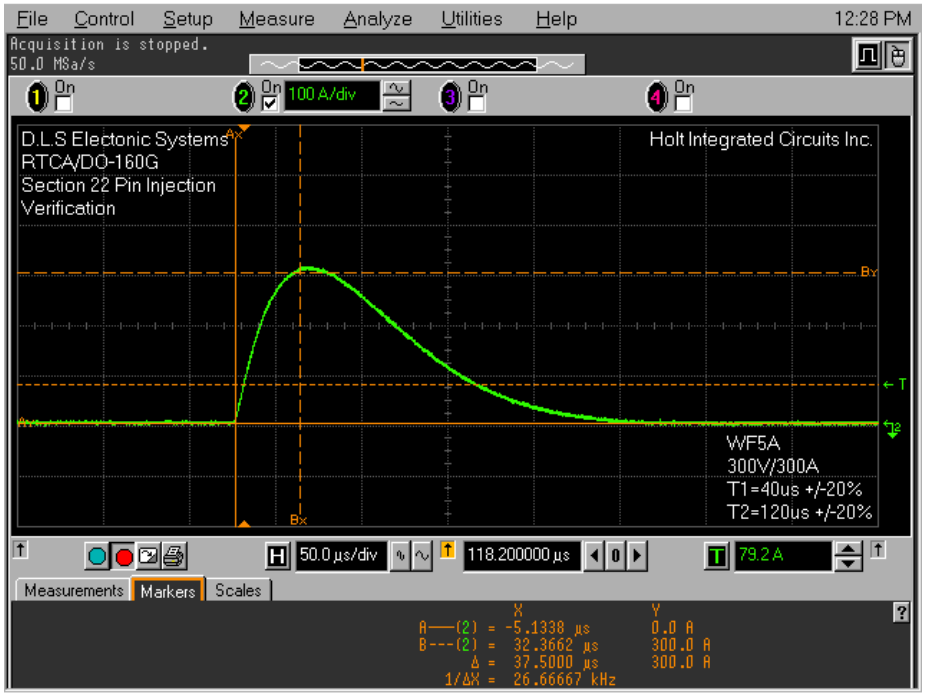

Acquisition
Sampling mode real time Configuration 4GSa/s
Memory depth manual Memory depth 32768pts
Sampling rate automatic Sampling rate 50.0 MSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 2
Scale 100 A/div Offset 195.4 A Coupling DC Impedance 1M Ohm
Attenuation 100.0 : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Time base
Scale 50.0 µs/div Position 118.20000 µs Reference center

Trigger
Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 2 Trigger level 79.2 A Slope rising

Measure

	current	mean	std dev	min	max
V max(1)	Source off	----------	----------	----------	----------
V min(1)	Source off	----------	----------	----------	----------
V max(2)	313.8 A	313.8 A	0.0 A	313.8 A	313.8 A
V min(2)	-4.6 A	-4.6 A	0.0 A	-4.6 A	-4.6 A

Marker

	current	mean	X	Y
V max(1)	Source off	----------	A——(2) = -5.1338 µs	0.0 A
V min(1)	Source off	----------	B---(2) = 32.3662 µs	300.0 A
V max(2)	313.8 A	313.8 A	Δ = 37.5000 µs	300.0 A
V min(2)	-4.6 A	-4.6 A	1/ΔX = 26.66667 kHz	

PIN INJECTION

WAVEFORM 5B CALIBRATION DATA SHEETS

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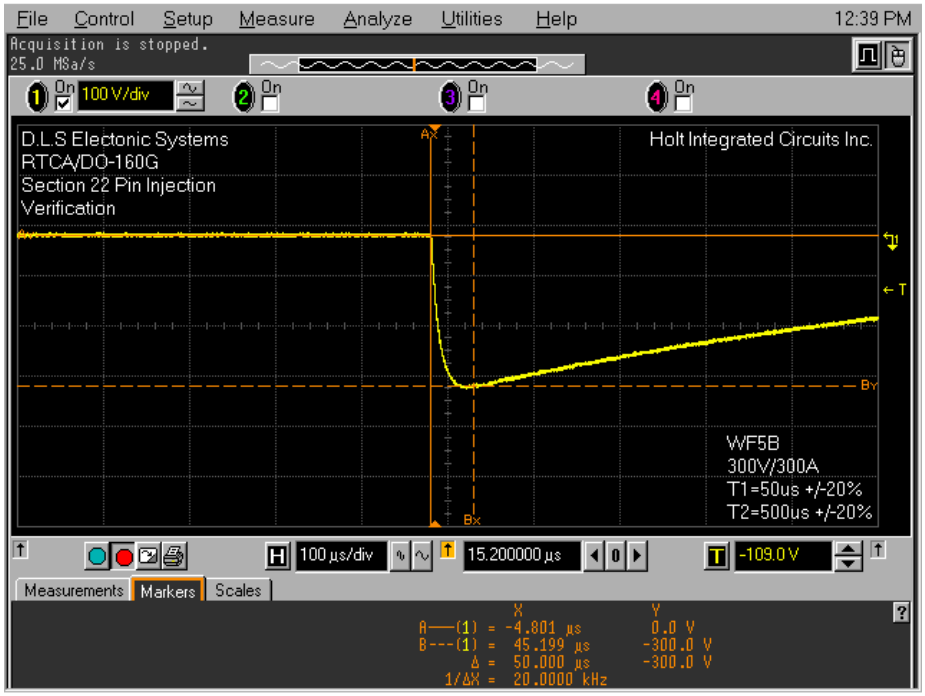

Acquisition
Sampling mode real time Configuration 4GSa/s
Memory depth manual Memory depth 32768pts
Sampling rate automatic Sampling rate 25.0 MSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 1
Scale 100 V/div Offset -181 V Coupling DC Impedance 1M Ohm
Attenuation 1.000 k : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Time base
Scale 100 µs/div Position 15.200000 µs Reference center

Trigger
Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 1 Trigger level -109.0 V Slope falling

Measure

	current	mean	std dev	min	max
V max(1)	5.4 V	5.4 V	0.0 V	5.4 V	5.4 V
V min(1)	-305.0 V	-305.0 V	0.0 V	-305.0 V	-305.0 V
V max(2)	Source off				
V min(2)	Source off				

Marker

	current	mean	X	Y
V max(1)	5.4 V	5.4 V	A—(1) = -4.801 µs	0.0 V
V min(1)	-305.0 V	-305.0 V	B---(1) = 45.199 µs	-300.0 V
V max(2)	Source off		Δ = 50.000 µs	-300.0 V
V min(2)	Source off		1/ΔX = 20.0000 kHz	

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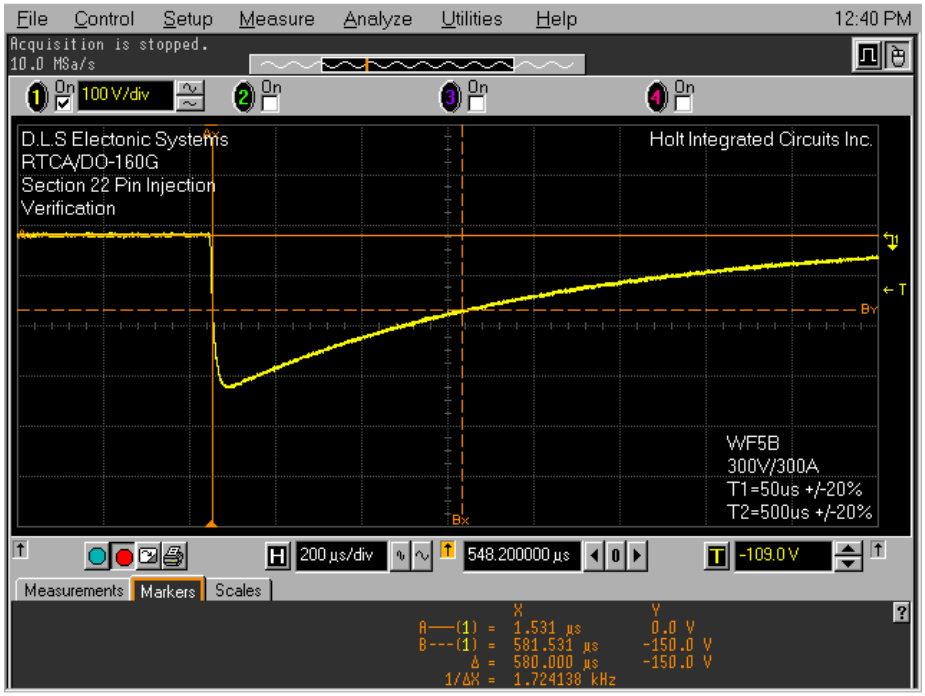

Acquisition
Sampling mode real time Configuration 4GSa/s
Memory depth manual Memory depth 32768pts
Sampling rate automatic Sampling rate 10.0 MSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 1
Scale 100 V/div Offset -181 V Coupling DC Impedance 1M Ohm
Attenuation 1.000 k : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Time base
Scale 200 µs/div Position 548.20000 µs Reference center

Trigger
Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 1 Trigger level -109.0 V Slope falling

Measure

	current	mean	std dev	min	max
V max(1)	5.1 V	5.1 V	0.0 V	5.1 V	5.1 V
V min(1)	-303.7 V	-303.7 V	0.0 V	-303.7 V	-303.7 V
V max(2)	Source off				
V min(2)	Source off				

Marker

	current	mean		X	Y
V max(1)	5.1 V	5.1 V	A—(1) =	1.531 µs	0.0 V
V min(1)	-303.7 V	-303.7 V	B---(1) =	581.531 µs	-150.0 V
V max(2)	Source off		Δ =	580.000 µs	-150.0 V
V min(2)	Source off		1/ΔX =	1.724138 kHz	

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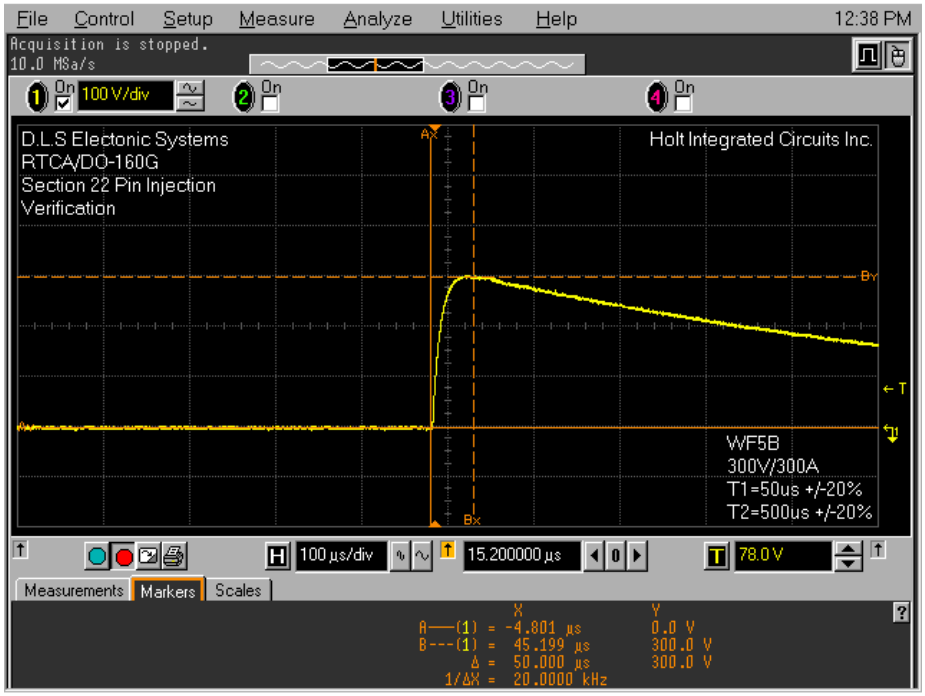

Acquisition
Sampling mode real time Configuration 4GSa/s
Memory depth manual Memory depth 32768pts
Sampling rate automatic Sampling rate 25.0 MSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 1
Scale 100 V/div Offset 204 V Coupling DC Impedance 1M Ohm
Attenuation 1.000 k : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Time base
Scale 100 µs/div Position 15.200000 µs Reference center

Trigger
Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 1 Trigger level 78.0 V Slope rising

Measure

	current	mean	std dev	min	max
V max(1)	305.7 V	305.7 V	0.0 V	305.7 V	305.7 V
V min(1)	-4.2 V	-4.2 V	0.0 V	-4.2 V	-4.2 V
V max(2)	Source off	---	---	---	---
V min(2)	Source off	---	---	---	---

Marker

	current	mean	X	Y
V max(1)	305.7 V	305.7 V	A—(1) = -4.801 µs	0.0 V
V min(1)	-4.2 V	-4.2 V	B---(1) = 45.199 µs	300.0 V
V max(2)	Source off	---	Δ = 50.000 µs	300.0 V
V min(2)	Source off	---	1/ΔX = 20.0000 kHz	

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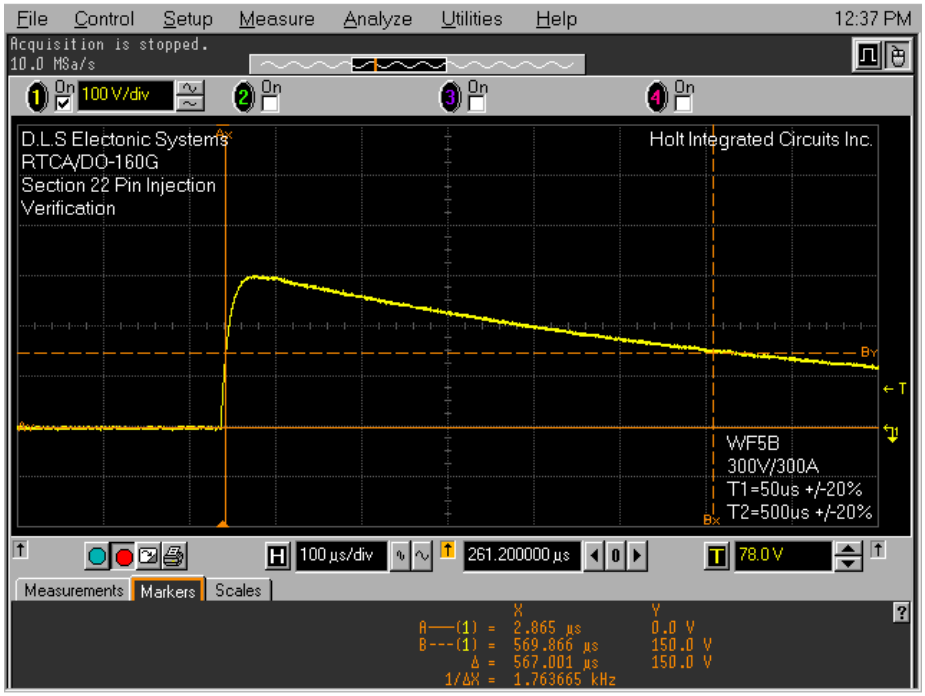

Acquisition
Sampling mode real time Configuration 4GSa/s
Memory depth manual Memory depth 32768pts
Sampling rate automatic Sampling rate 25.0 MSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 1
Scale 100 V/div Offset 204 V Coupling DC Impedance 1M Ohm
Attenuation 1.000 k : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Time base
Scale 100 µs/div Position 261.20000 µs Reference center

Trigger
Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 1 Trigger level 78.0 V Slope rising

Measure

	current	mean	std dev	min	max
V max(1)	305.7 V	305.7 V	0.0 V	305.7 V	305.7 V
V min(1)	-3.9 V	-3.9 V	0.0 V	-3.9 V	-3.9 V
V max(2)	Source off				
V min(2)	Source off				

Marker

	current	mean		X	Y
V max(1)	305.7 V	305.7 V	A—(1) =	2.865 µs	0.0 V
V min(1)	-3.9 V	-3.9 V	B---(1) =	569.866 µs	150.0 V
V max(2)	Source off		Δ =	567.001 µs	150.0 V
V min(2)	Source off		1/ΔX =	1.763665 kHz	

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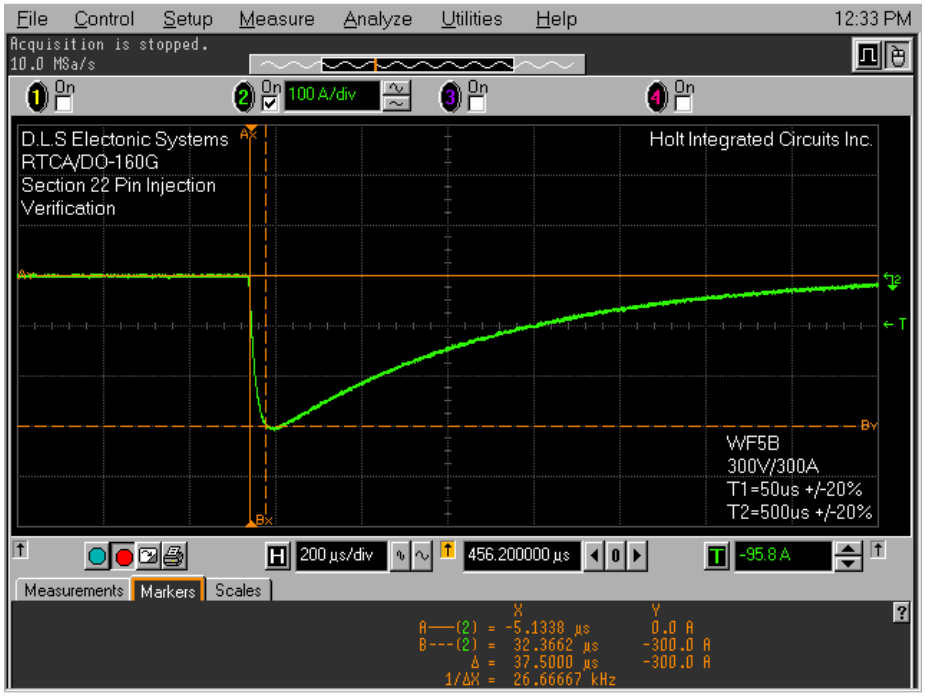

Acquisition Sampling mode real time Configuration 4GSa/s
Memory depth manual Memory depth 32768pts
Sampling rate automatic Sampling rate 10.0 MSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 2 Scale 100 A/div Offset -98.6 A Coupling DC Impedance 1M Ohm
Attenuation 100.0 : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Time base Scale 200 µs/div Position 456.20000 µs Reference center

Trigger Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 2 Trigger level -95.8 A Slope falling

Measure

	current	mean	std dev	min	max
V max(1)	Source off	----------	----------	----------	----------
V min(1)	Source off	----------	----------	----------	----------
V max(2)	6.0 A	6.0 A	0.0 A	6.0 A	6.0 A
V min(2)	-305.7 A	-305.7 A	0.0 A	-305.7 A	-305.7 A

Marker

	current	mean	X	Y
V max(1)	Source off	----------	A——(2) = -5.1338 µs	0.0 A
V min(1)	Source off	----------	B---(2) = 32.3662 µs	-300.0 A
V max(2)	6.0 A	6.0 A	Δ = 37.5000 µs	-300.0 A
V min(2)	-305.7 A	-305.7 A	1/ΔX = 26.66667 kHz	

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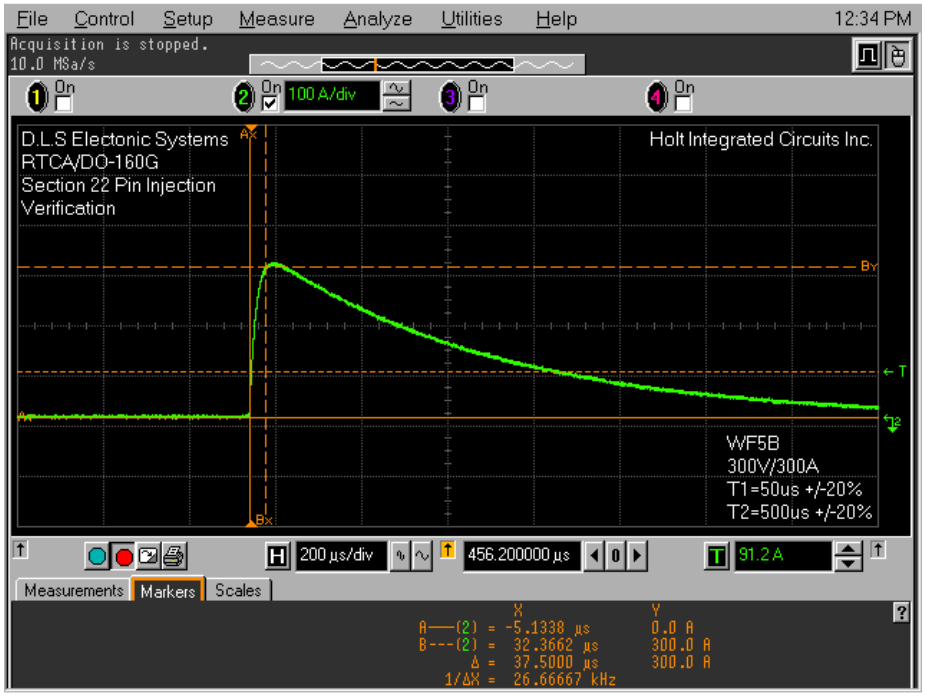

Acquisition
Sampling mode real time Configuration 4GSa/s
Memory depth manual Memory depth 32768pts
Sampling rate automatic Sampling rate 10.0 MSa/s
Averaging off
9-bit BW Filter off Interpolation on

Channel 2
Scale 100 A/div Offset 182.4 A Coupling DC Impedance 1M Ohm
Attenuation 100.0 : 1 Atten units ratio Skew 0.0 s
Ext adapter None Ext coupler None
Ext gain 1.00E+00 Ext offset 0.0E+00

Time base
Scale 200 µs/div Position 456.20000 µs Reference center

Trigger
Mode edge Sweep triggered
Hysteresis normal Holdoff time 60 ns Coupling DC
Source channel 2 Trigger level 91.2 A Slope rising

Measure

	current	mean	std dev	min	max
V max(1)	Source off	----------	----------	----------	----------
V min(1)	Source off	----------	----------	----------	----------
V max(2)	308.6 A	308.6 A	0.0 A	308.6 A	308.6 A
V min(2)	-4.1 A	-4.1 A	0.0 A	-4.1 A	-4.1 A

Marker

	current	mean	X	Y
V max(1)	Source off	----------	A——(2) = -5.1338 µs	0.0 A
V min(1)	Source off	----------	B---(2) = 32.3662 µs	300.0 A
V max(2)	308.6 A	308.6 A	Δ = 37.5000 µs	300.0 A
V min(2)	-4.1 A	-4.1 A	1/ΔX = 26.66667 kHz	