PROTOCOL

to exercise

Time Domain Reflectometry

Class	Secretary	Signature
4BHELS	**HOFSTÄTTER A.**	
Exercise- / Delivery date 25th February 2015 4th March 2015	Employee	Signature
Teacher GRASINGER	Employee	Signature
Grade	**Employee**	Signature

Time Domain Reflectometry

Used Devices

Nr.	Device	Manufacturer	Type	
1.	**Oscilloscope**	**-**		
2.	**Function generator**	**-**		

1 Inhalt

2 General Information

Time-domain reflectometry or TDR is a measurement technique used to determine the characteristics of electrical lines by observing reflected waveforms

The spike pulse travels at the propagation speed to the end of the cable and if the end is unterminated (open end) it is reflected and travels back to the Oscilloscope!

At known cable length the propagation speed can be calculated. For coaxial cables it is about 2/3 of the speed offlight in vacuum. At known propagation speed of the cable it is possible to calculate the cable length.
If the cable has any defects (Impedance changes) it is possible to calculate the distance to the defect.

2.1 Given Exercises

• Measure the propagation speed.
• Terminate the cable with different resistors (a Potentiometer) and determine the resistance with a minimum of reflections. This is the characteristic impedance of the cable.
• Measure the length of a cable with unknown length by using TDR

Three different wires were used for measurement

- RG58 Cable with 100 m length
- A random unknown length Cable
- A available LAN Cat 5e Cable, built-in wire

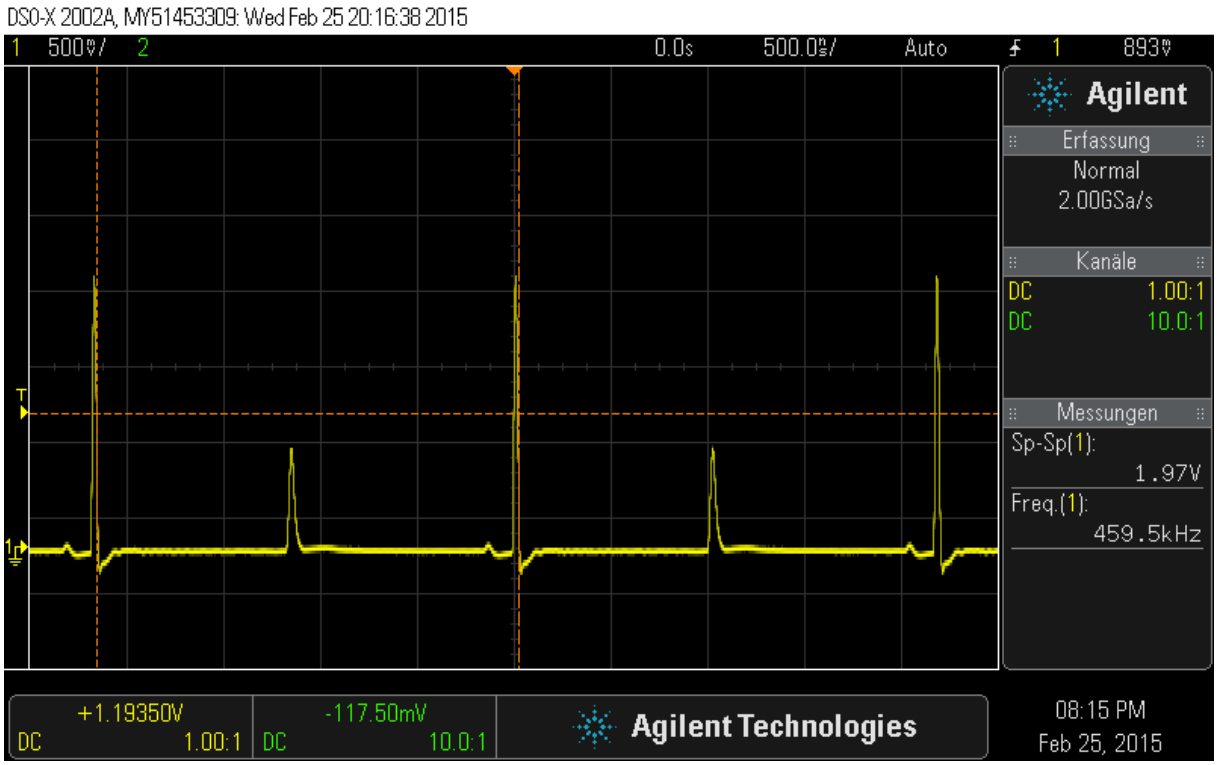
3 Measurement of a RG58 Cable with 100 m length

3.1 Measurement the propagation speed

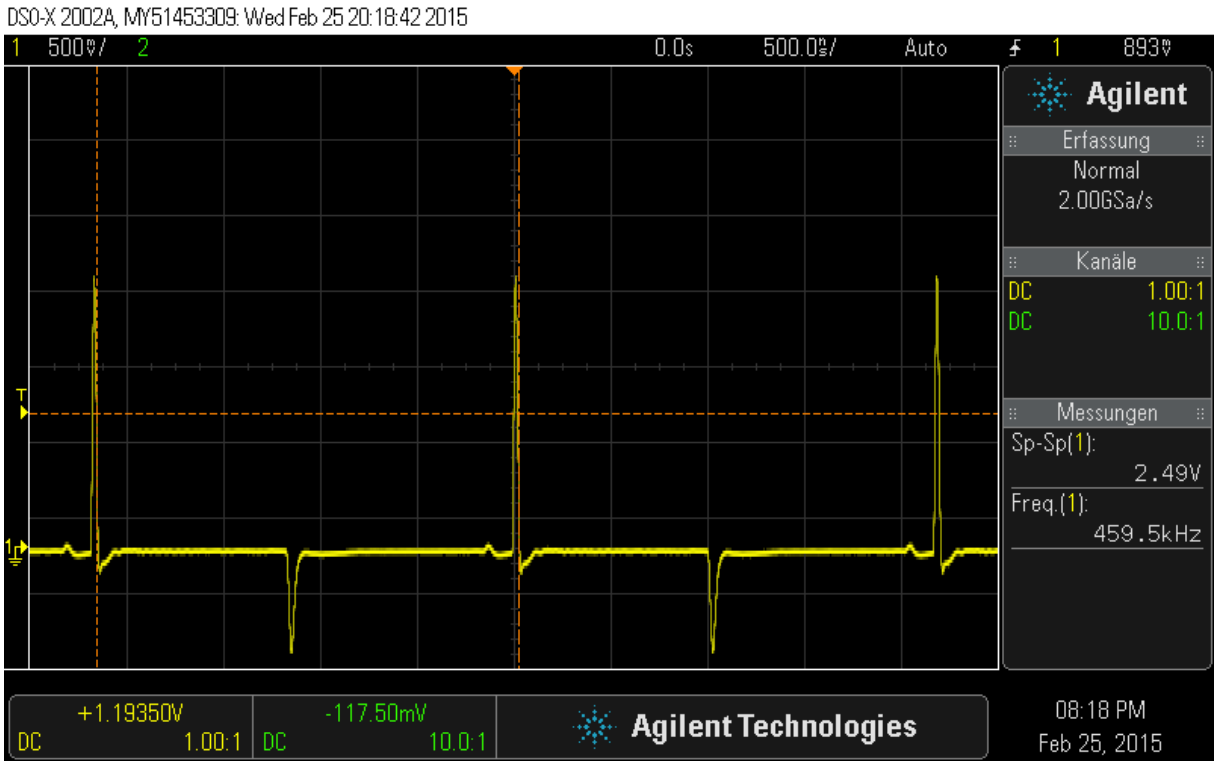
The propagation time of the cable was 232 ns.

$$v = \frac{100\ m}{232\ ns} = 431\ 034\ 482\ m/s = 1{,}55 * 10^9 km/h$$

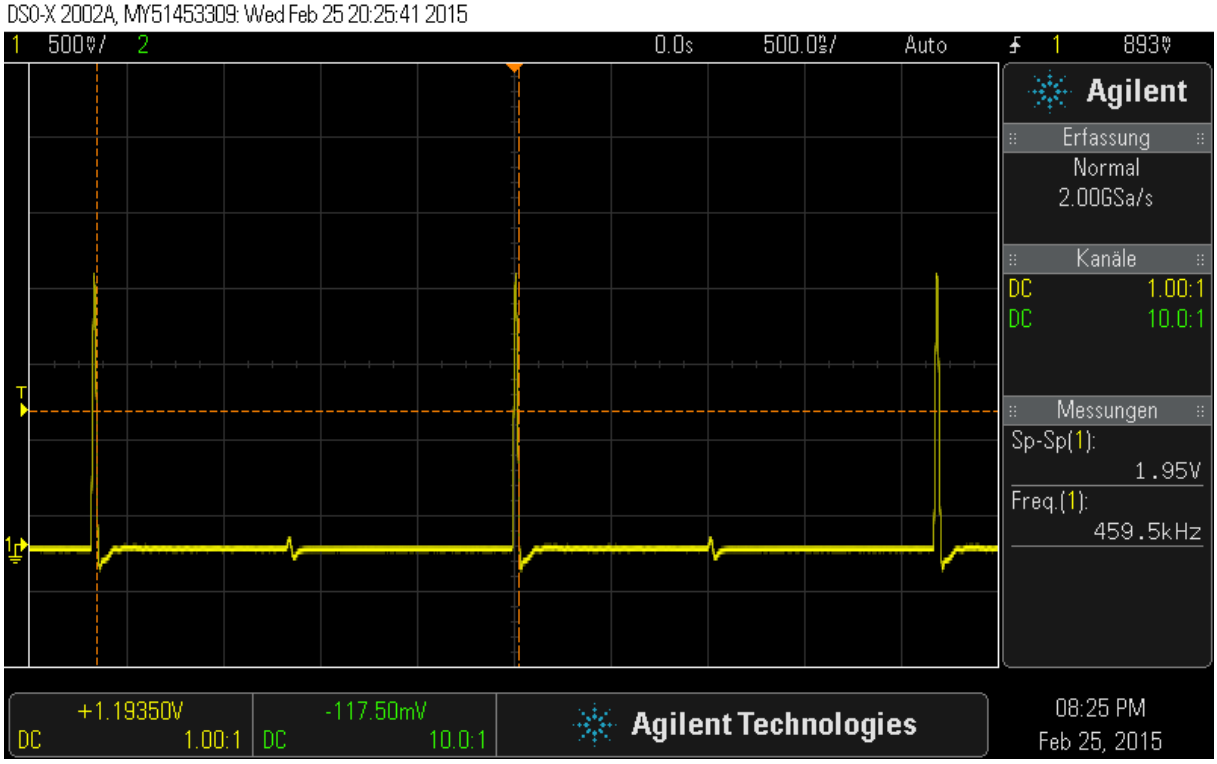
3.2 Open End



3.3 Short Circuit

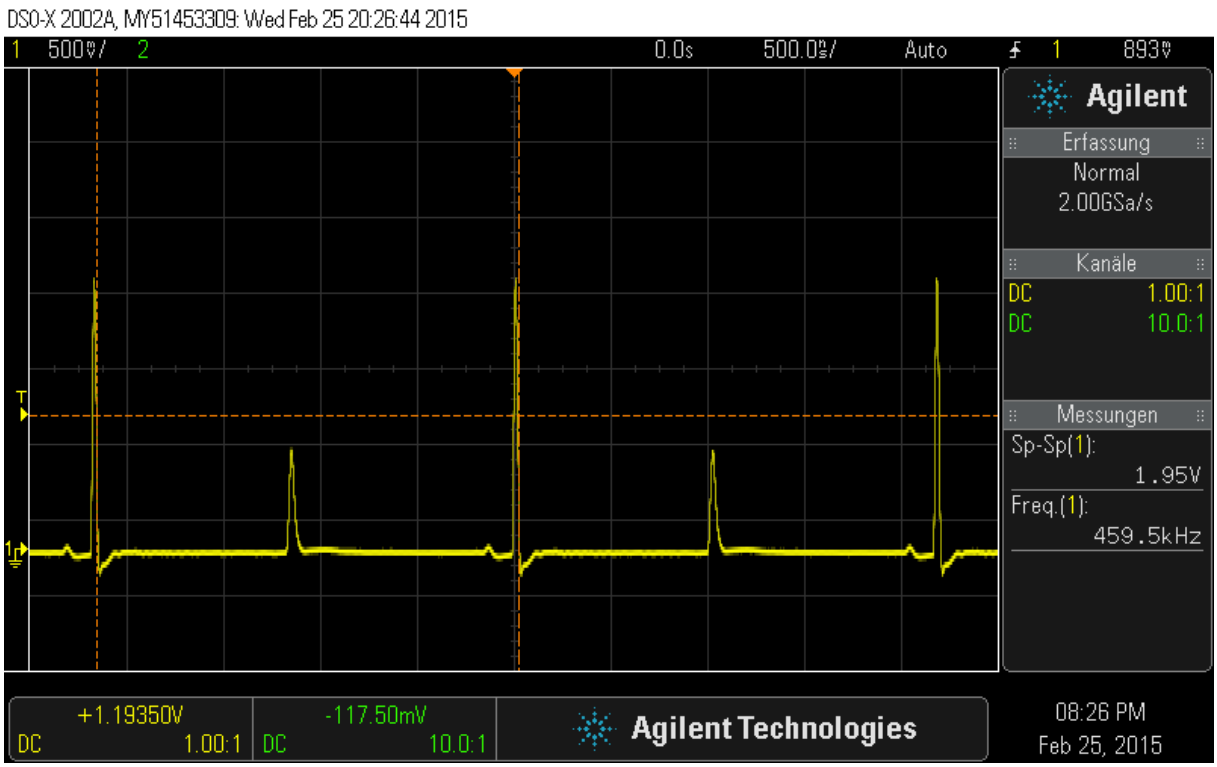


3.4 Potentiometer

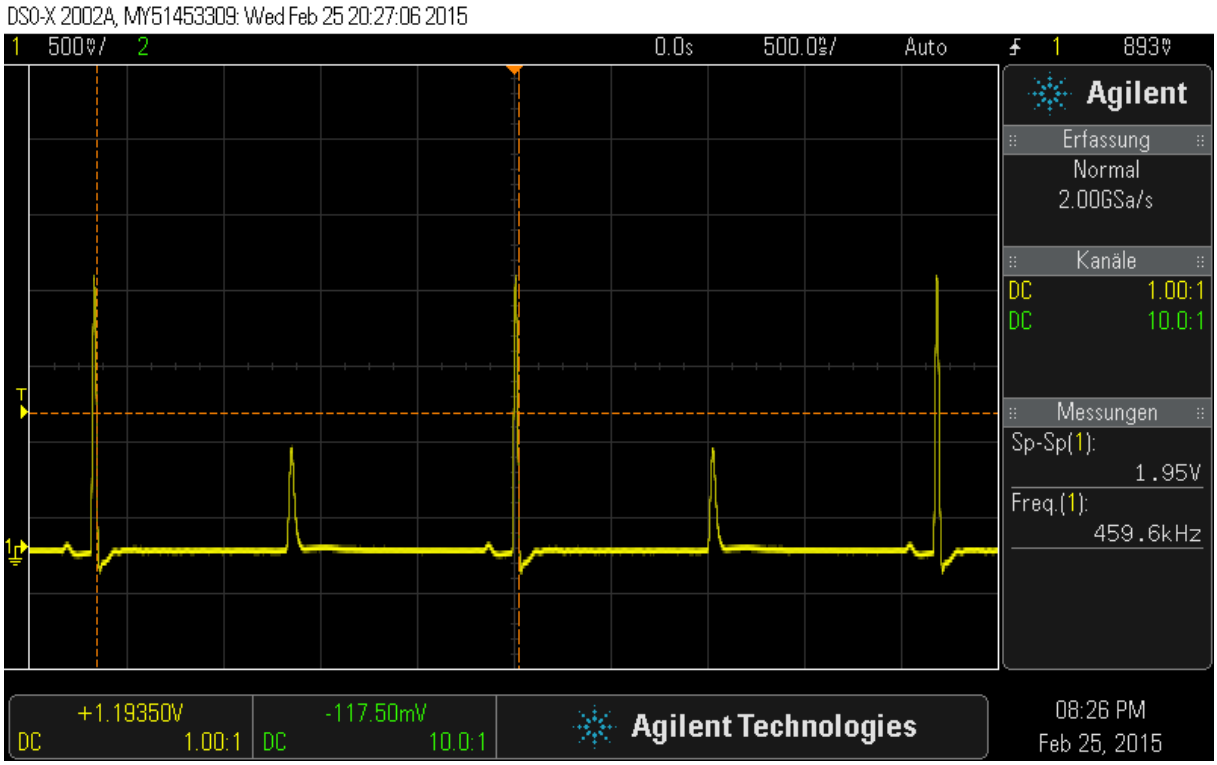


The right resistors value for the potentiometer which was set was $54{,}6\ \Omega$.

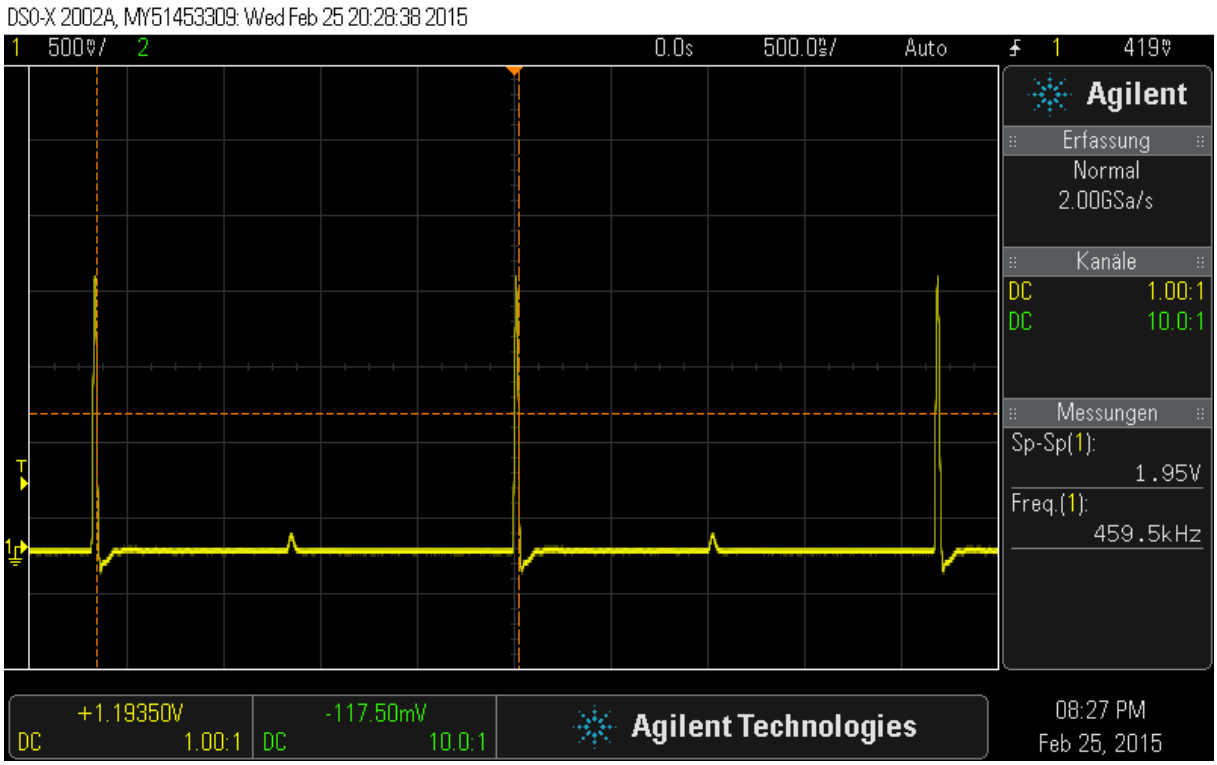
3.5 100 Ω



3.6 75 Ω



3.7 60 Ω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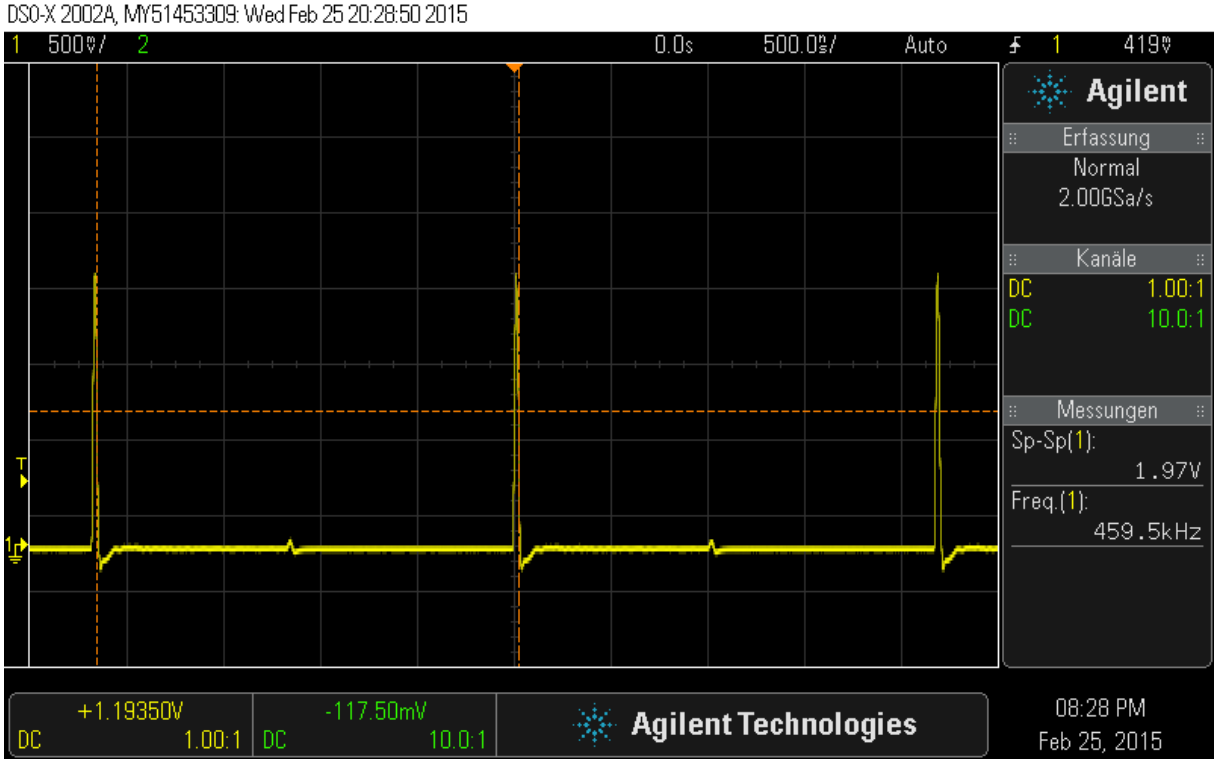
0.0s
500.0ns/
Auto
1 419mV
Agilent
Erfassung
Normal
2.00GSa/s
Kanäle
DC 1.00:1
DC 10.0:1
Messungen
Sp-Sp(1):
1.95V
Freq.(1):
459.5kHz
+1.19350V
DC 1.00:1
-117.50mV
DC 10.0:1
Agilent Technologies
08:27 PM
Feb 25, 2015

3.8 50 Ω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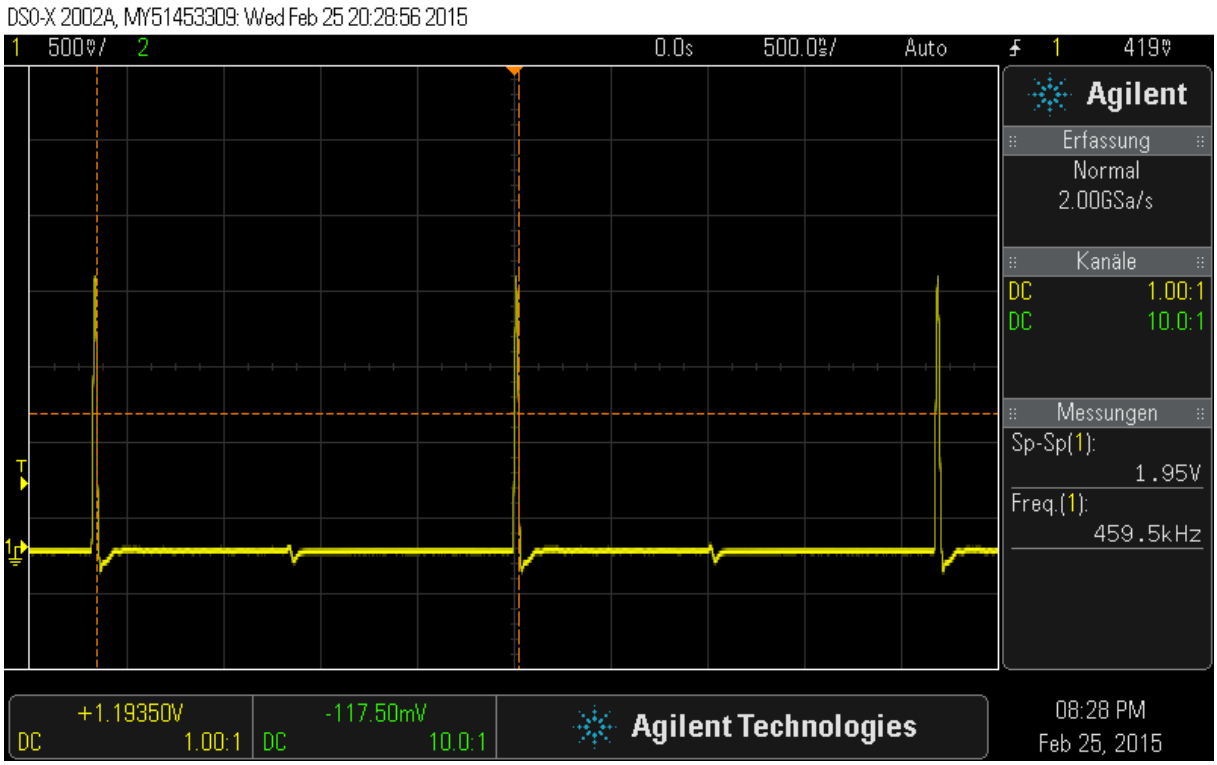
500.0ns/
Auto
1 419mV
Agilent
Erfassung
Normal
2.00GSa/s
Kanäle
DC 1.00:1
DC 10.0:1
Messungen
Sp-Sp(1):
1.97V
Freq.(1):
459.5kHz
+1.19350V
DC 1.00:1
-117.50mV
DC 10.0:1
Agilent Technologies
08:28 PM
Feb 25, 2015

3.9 30 Ω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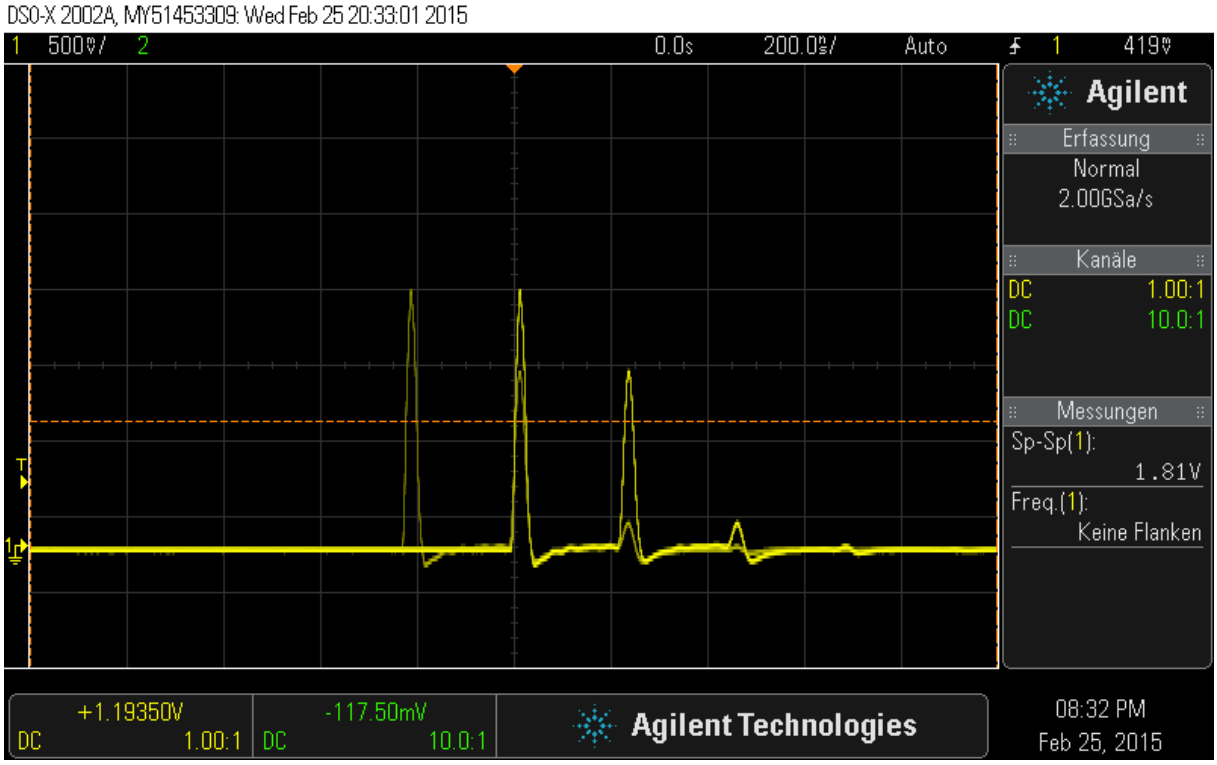
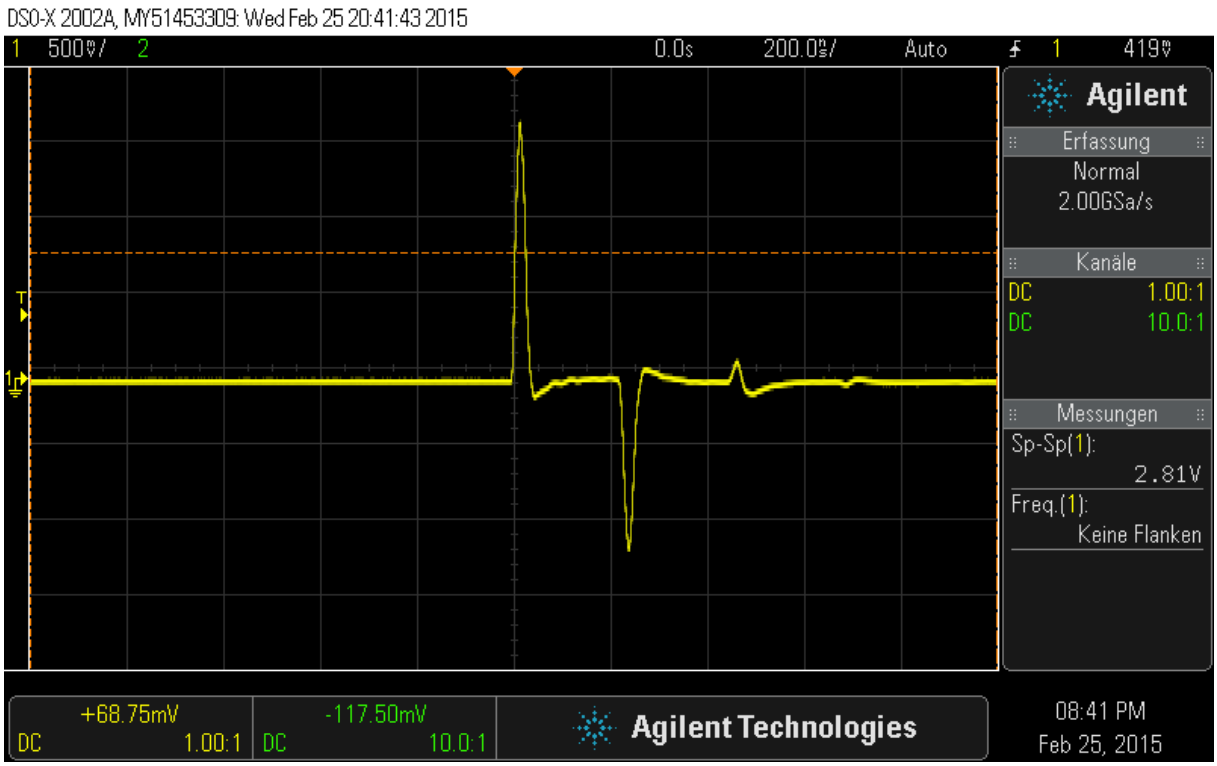
500.0ps/
Auto
1 419mV
Agilent
Erfassung
Normal
2.00GSa/s
Kanäle
DC 1.00:1
DC 10.0:1
Messungen
Sp-Sp(1):
1.95V
Freq.(1):
459.5kHz
+1.19350V
DC 1.00:1
-117.50mV
DC 10.0:1
Agilent Technologies
08:28 PM
Feb 25, 2015

4 Cable with an unknown length

4.1 Open End

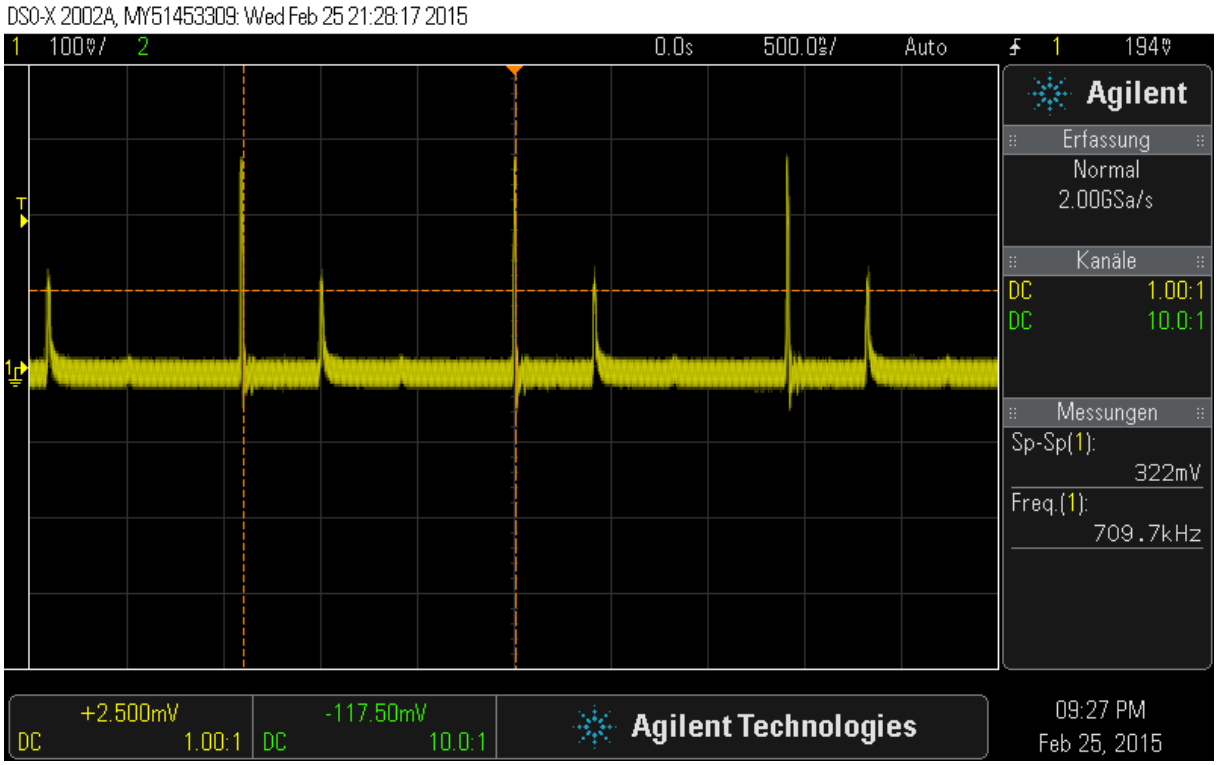


4.2 Short circuit

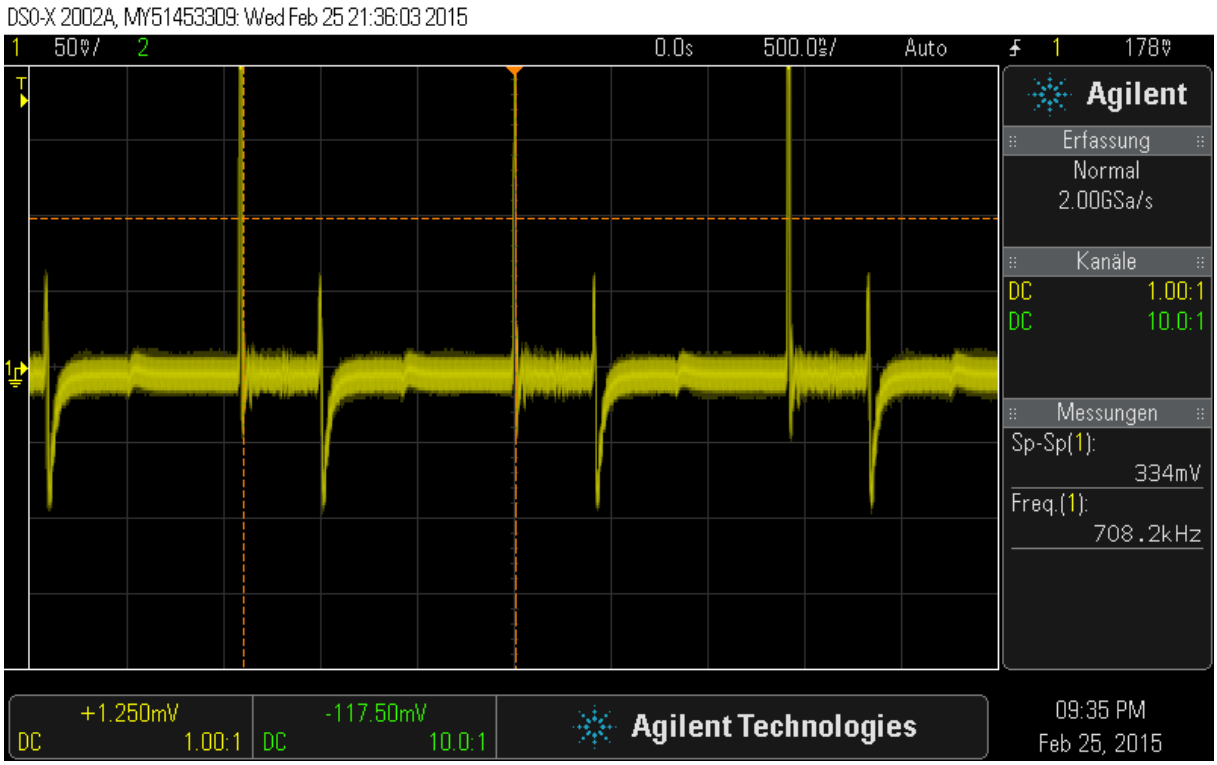


5 Measurement of an LAN Cable

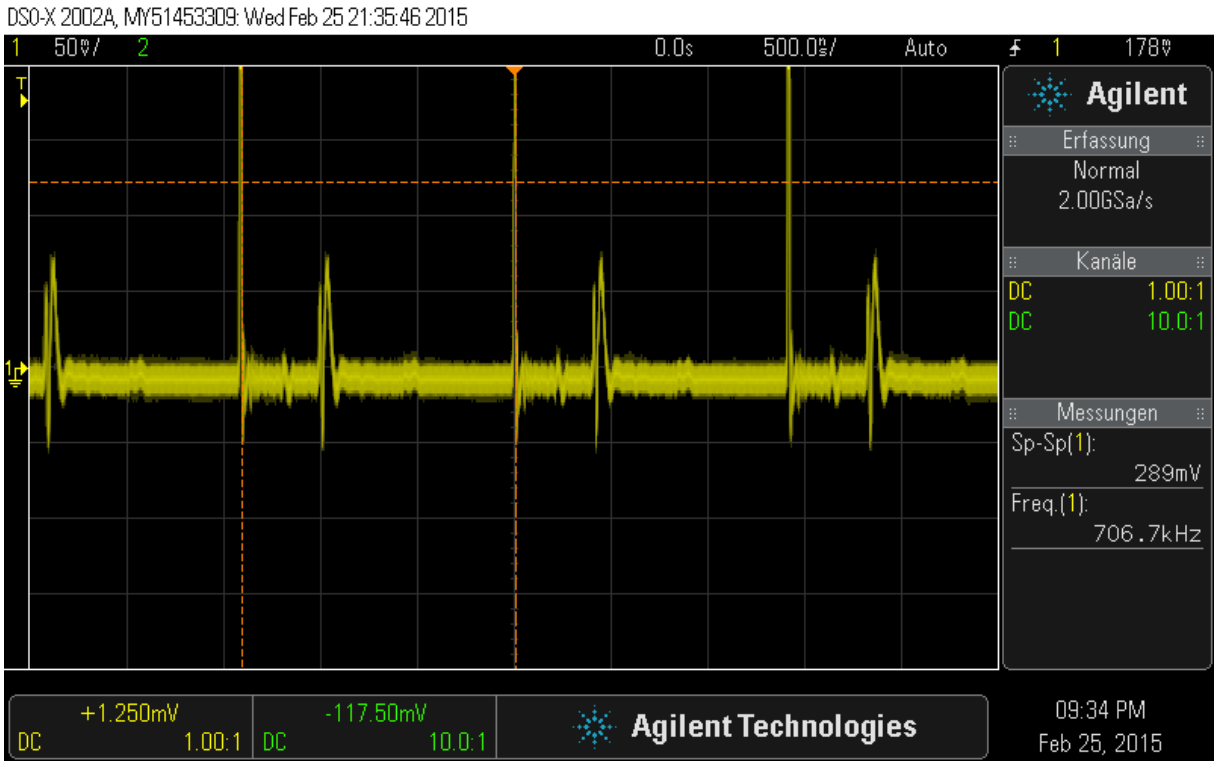
5.1 Open End



5.2 Short circuit

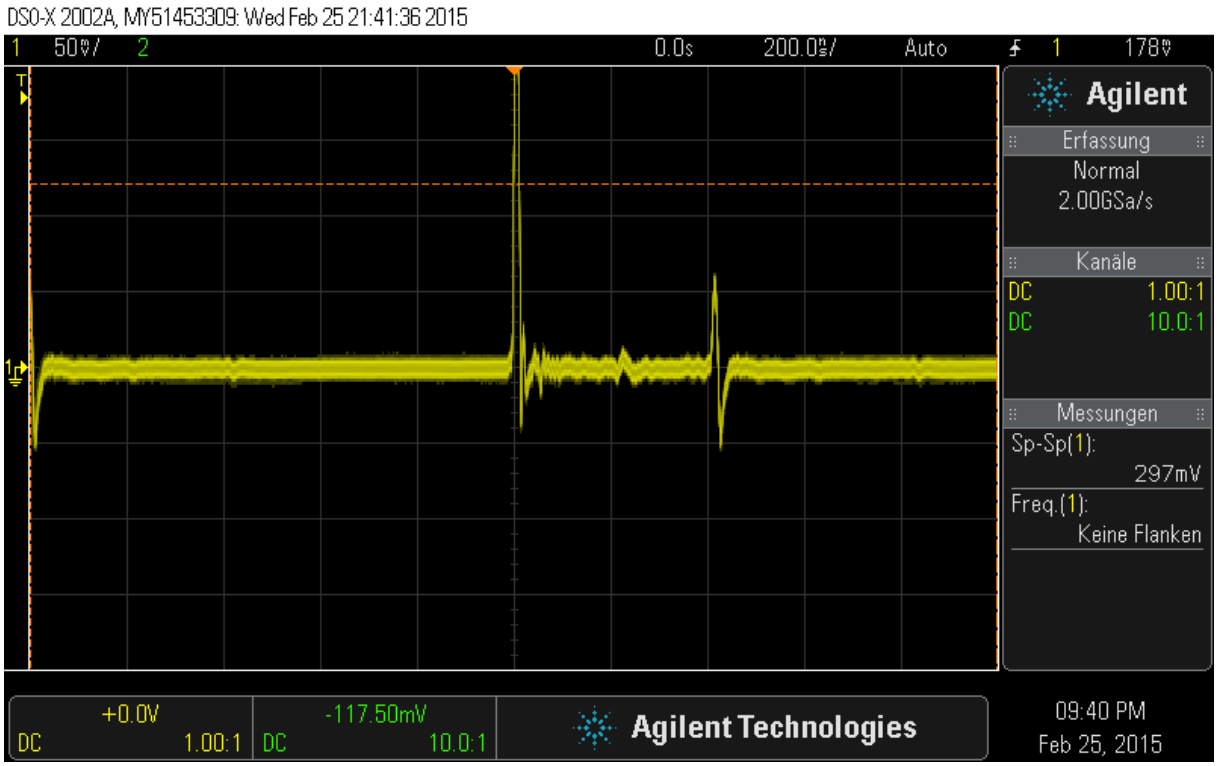


5.3 Potentiometer

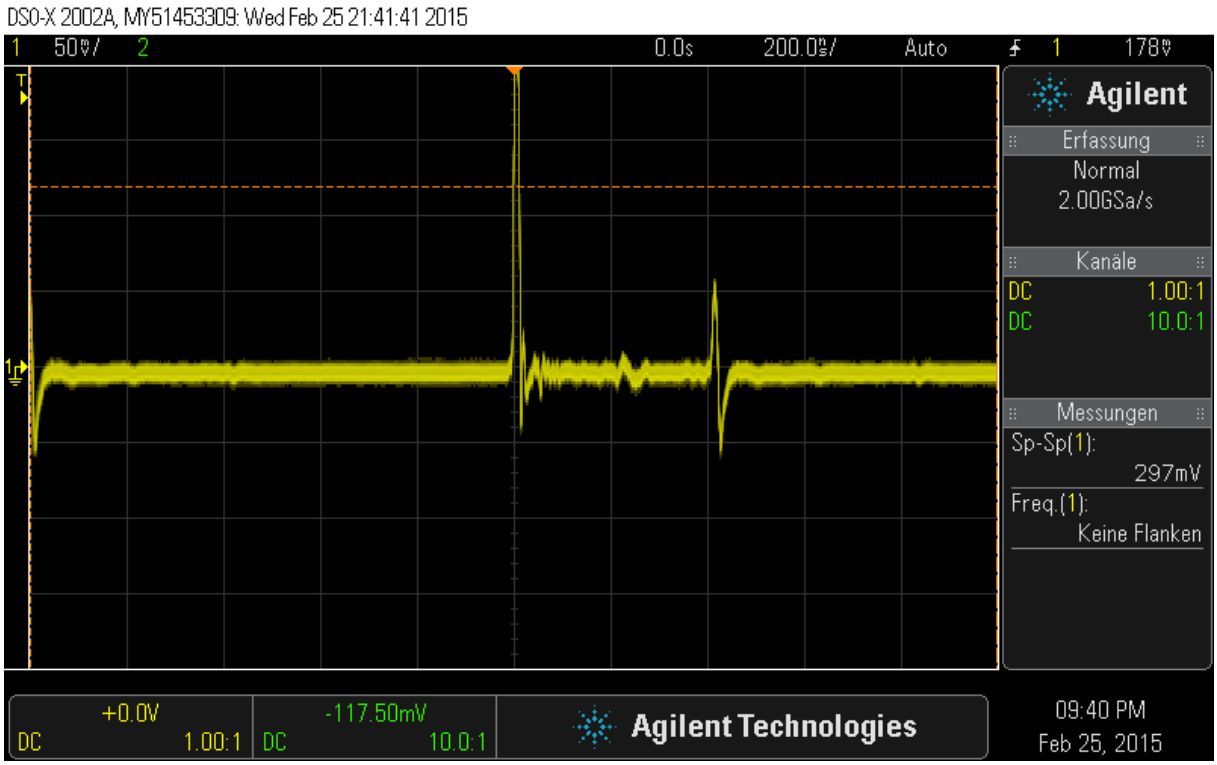


The measured resistance of the optimal potentiometer value was 71.5 Ω for the LAN cable.

5.4 100 Ω



5.5 75 Ω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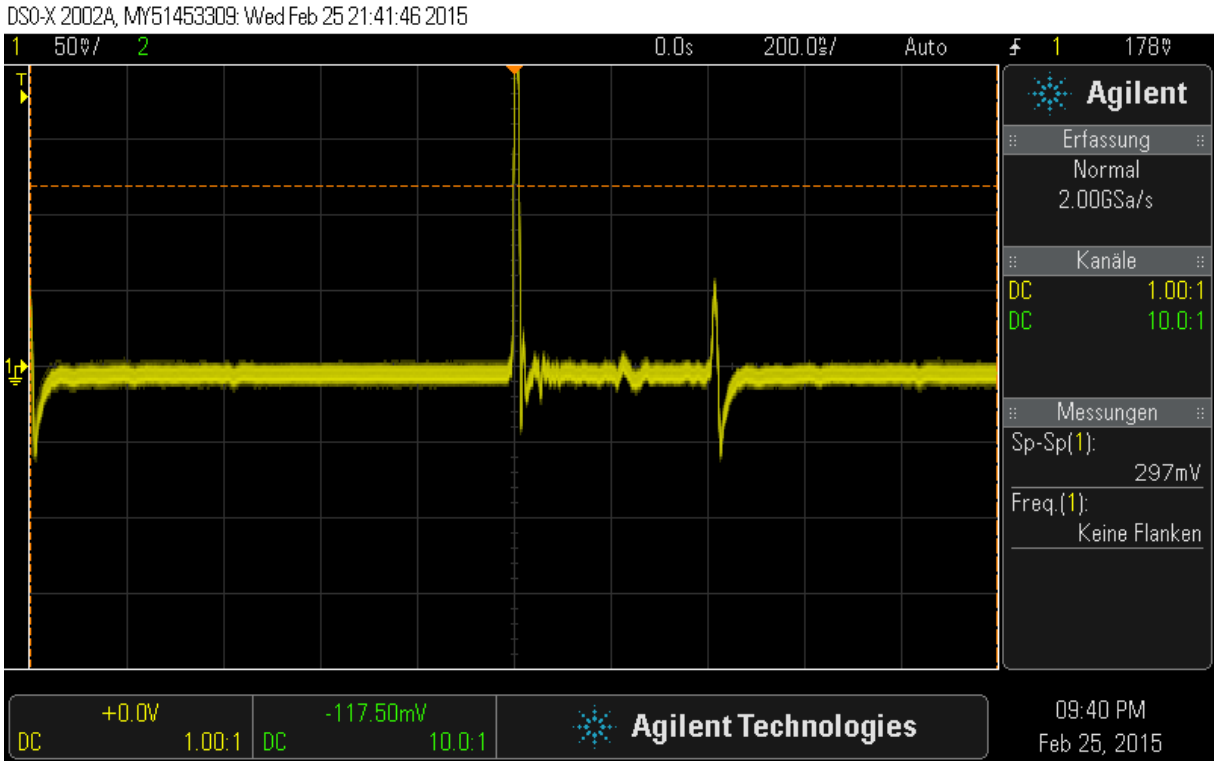
1 50mV/ 2
0.0s
200.0ns/
Auto
1 178mV
Agilent
Erfassung
Normal
2.00GSa/s
Kanäle
DC 1.00:1
DC 10.0:1
Messungen
Sp-Sp(1):
297mV
Freq.(1):
Keine Flanken
+0.0V
DC 1.00:1
-117.50mV
DC 10.0:1
Agilent Technologies
09:40 PM
Feb 25, 2015

5.6 60 Ω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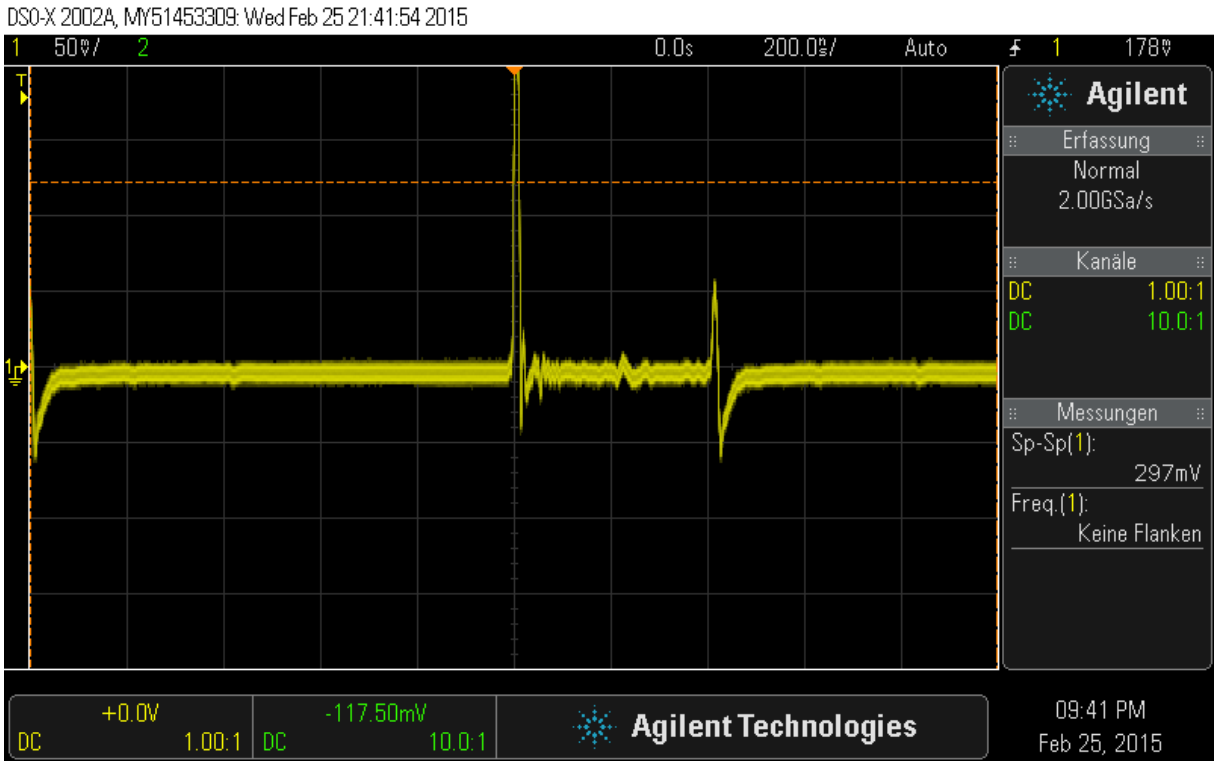
0.0s
200.0ns/
Auto
1 178mV
Agilent
Erfassung
Normal
2.00GSa/s
Kanäle
DC 1.00:1
DC 10.0:1
Messungen
Sp-Sp(1):
297mV
Freq.(1):
Keine Flanken
+0.0V
DC 1.00:1
-117.50mV
DC 10.0:1
Agilent Technologies
09:40 PM
Feb 25, 2015

5.7 50 Ω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0.0s
200.0ns/
Auto
1 178mV
Agilent
Erfassung
Normal
2.00GSa/s
Kanäle
DC 1.00:1
DC 10.0:1
Messungen
Sp-Sp(1):
297mV
Freq.(1):
Keine Flanken
+0.0V
DC 1.00:1
-117.50mV
DC 10.0:1
Agilent Technologies
09:41 PM
Feb 25, 2015