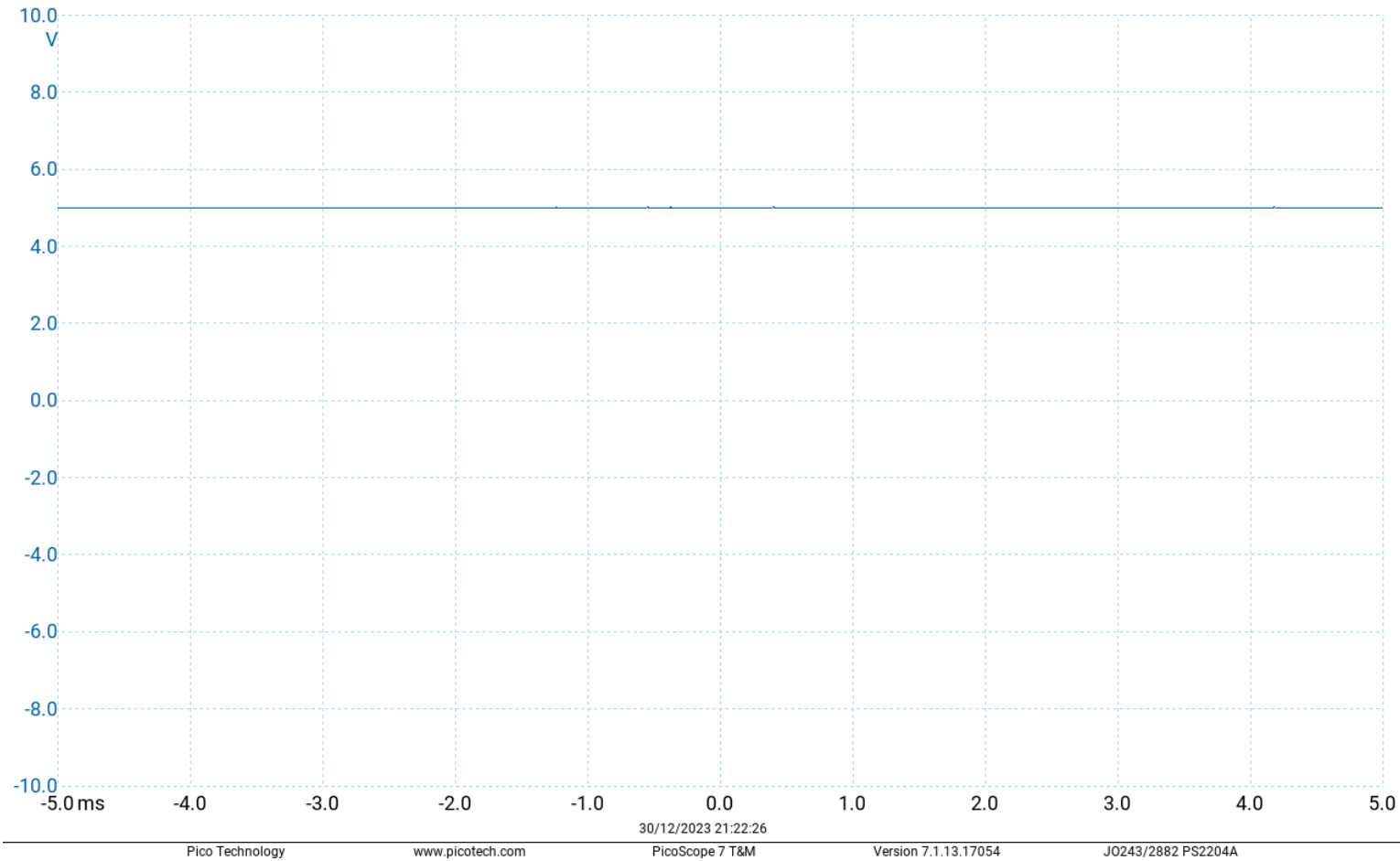
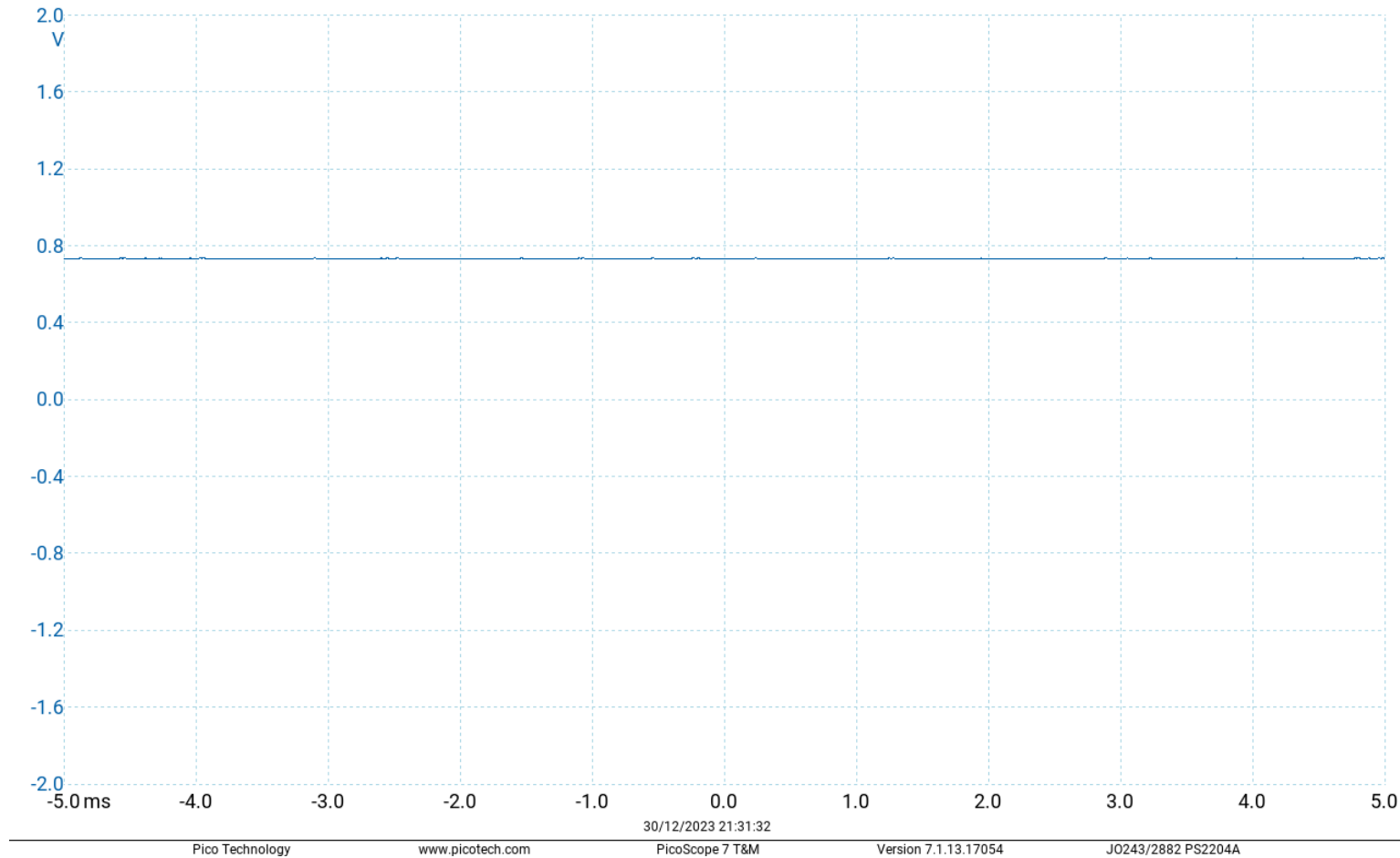


Exercise E2



$$V_{USB} = 5.012V$$

Exercise E2

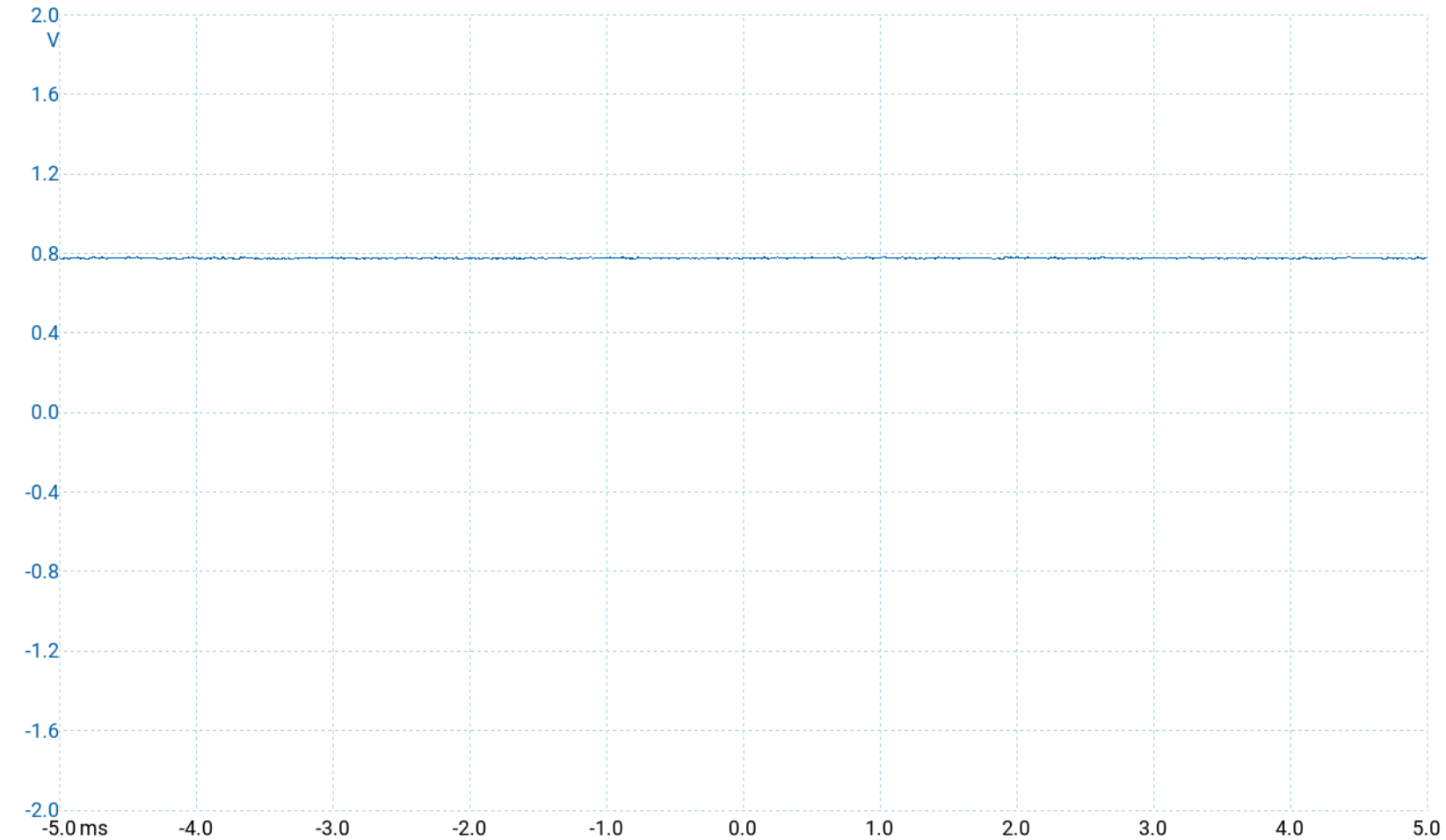


$V_{fd} = 0.729V$ (Note: V_{fd} is forward biased voltage drop across diode)

Exercise E2

- Experimental values:
 - $V_{fd} = 0.729V$
 - $I = \frac{V_{USB} - V_{fd}}{R_0} = 9.113mA$
- Theoretical values from LTSpice in E1:
 - $I = 9.17mA$
 - $V_{fd} = 0.690V$
- The two results are closely matched.

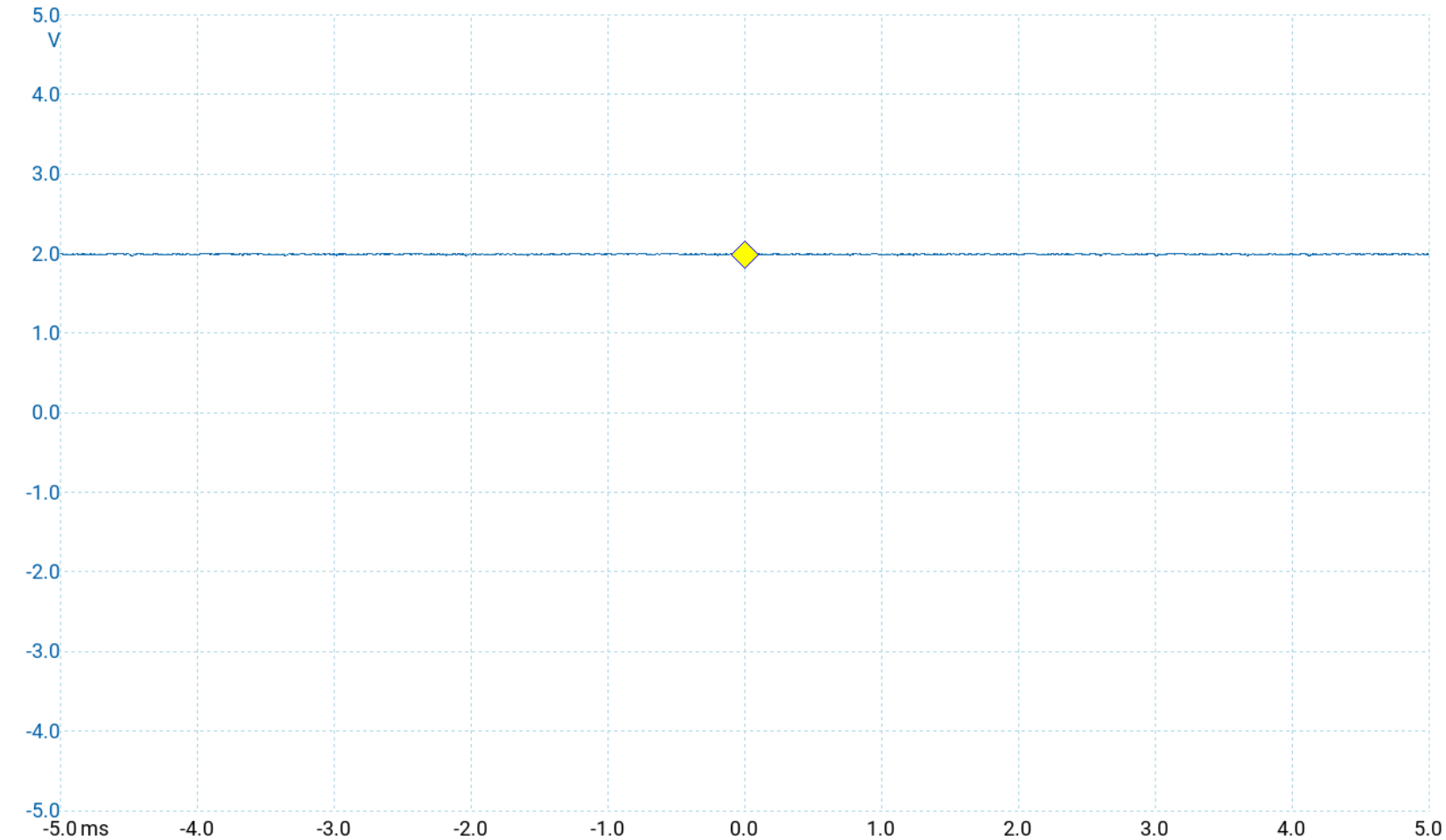
Exercise E2



Channel	Name	Span	Value	Min.	Max.	\bar{x}	σ
A	Maximum	Whole trace	788.8 mV	786.5 mV	789.9 mV	788.8 mV	1.257 mV
A	Minimum	Whole trace	773.2 mV	773.1 mV	774.3 mV	773.4 mV	496 μ V

- 1N4001:
- $V_{fd} = 0.700V$

Exercise E2

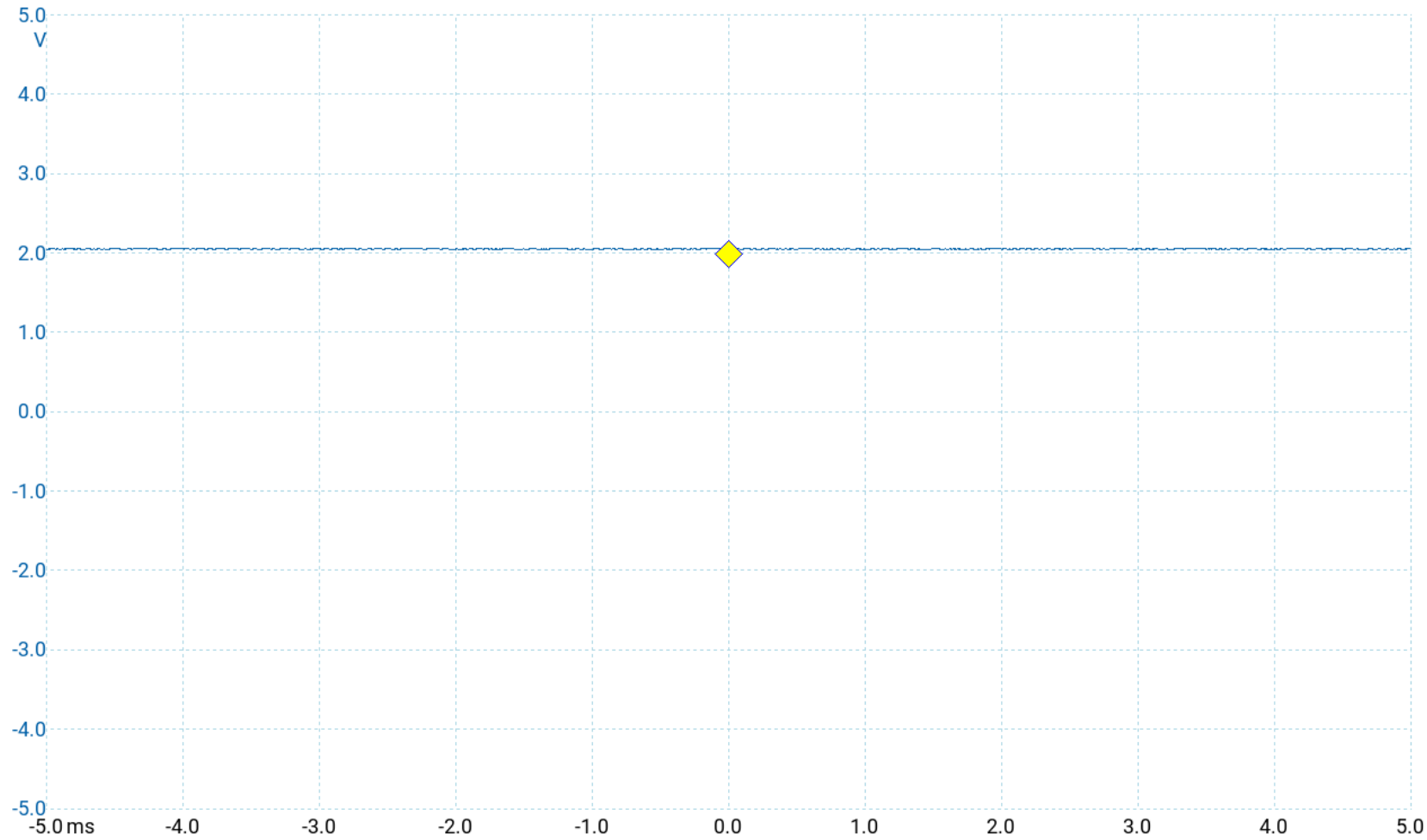


- Yellow LED:
- $V_{fd} = 2.000V$

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Channel	Name	Span	Value	Min.	Max.	\bar{x}	σ
A	Maximum	Whole trace	2.016 V	2.013 V	2.019 V	2.017 V	1.238 mV
A	Minimum	Whole trace	1.98 V	1.974 V	1.985 V	1.98 V	1.536 mV

Exercise E2

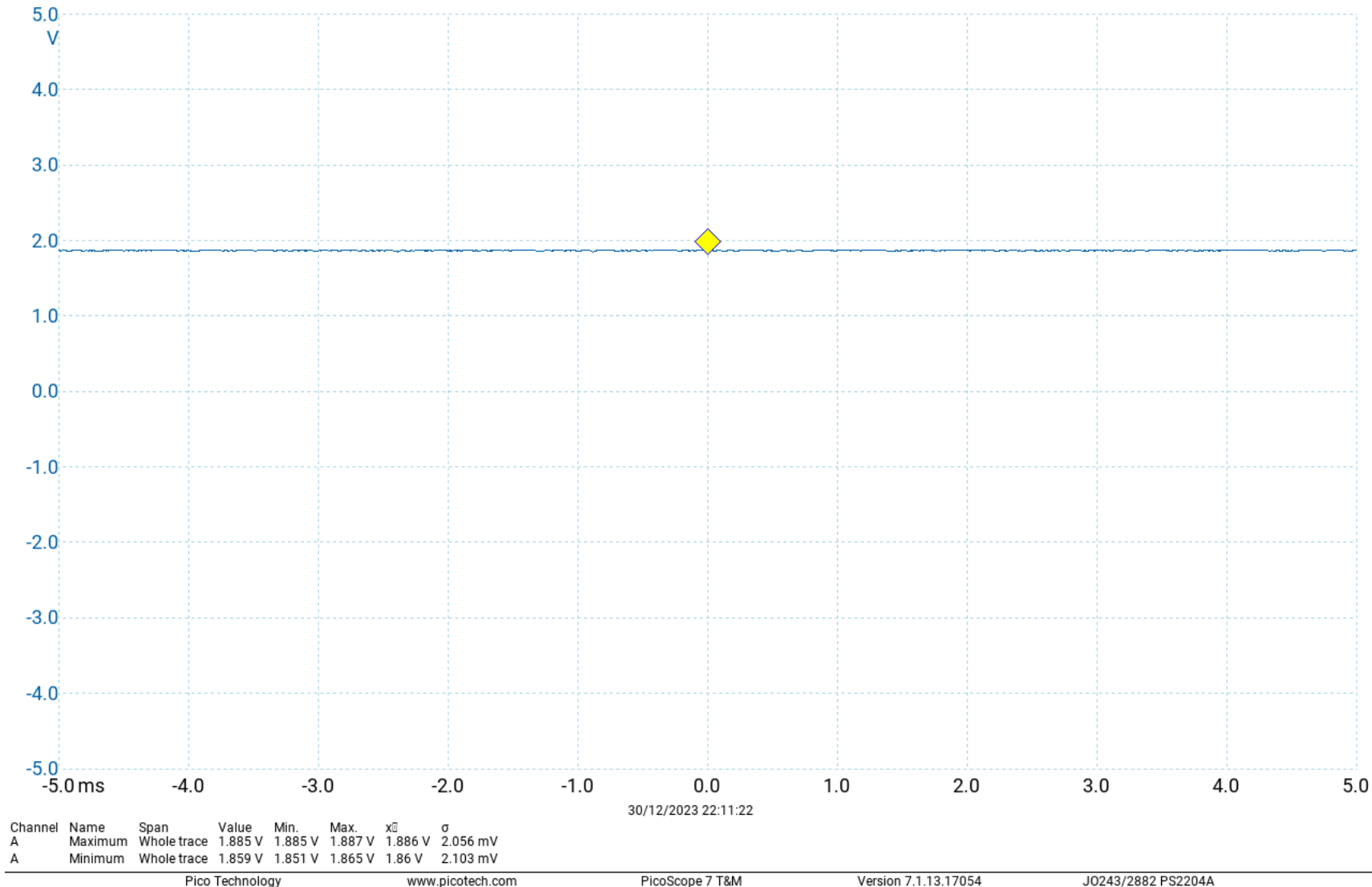


- Green LED:
- $V_{fd} = 2.057V$

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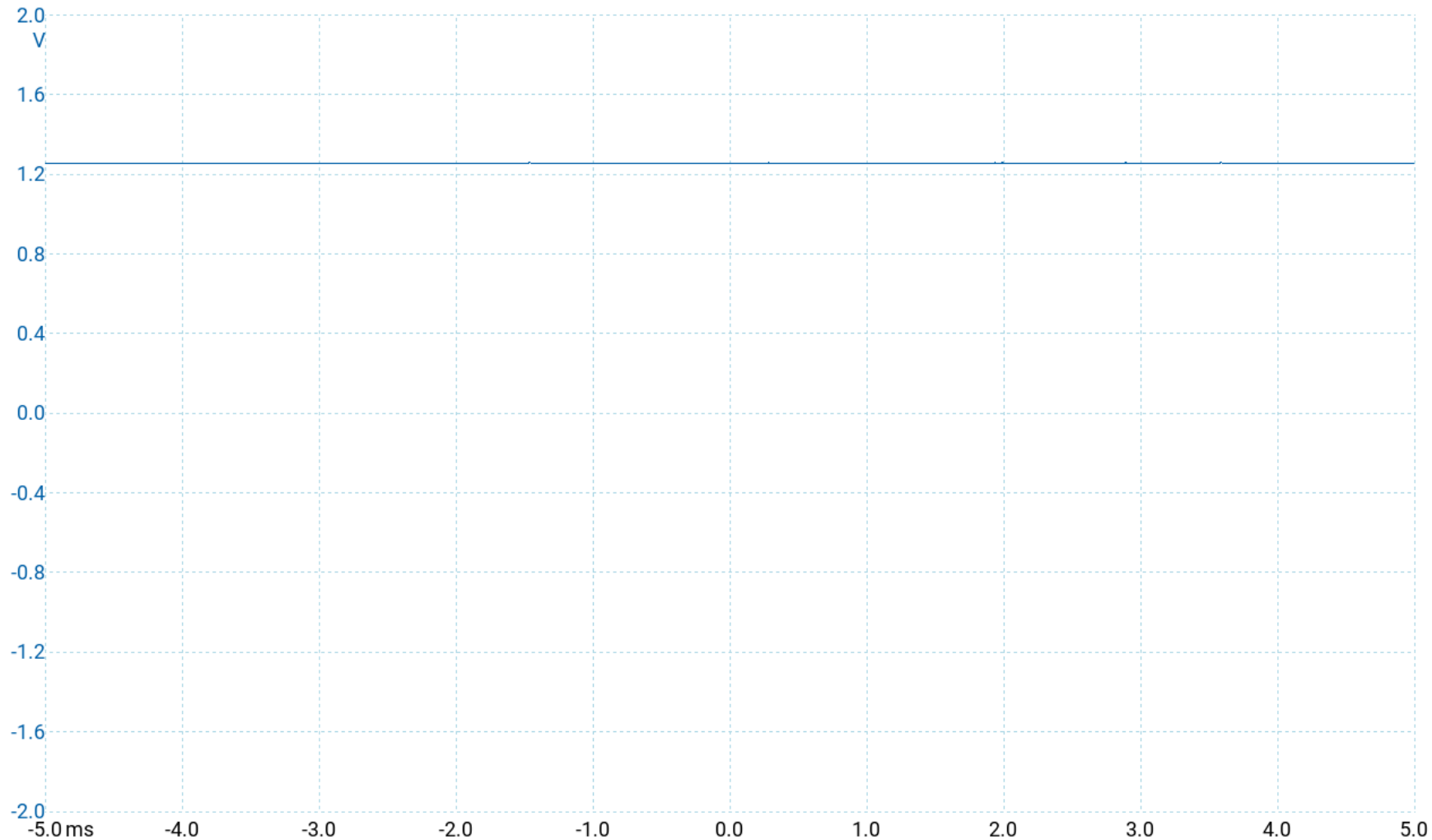
Channel	Name	Span	Value	Min.	Max.	\bar{x}	σ
A	Maximum	Whole trace	2.064 V	2.013 V	2.075 V	2.024 V	16.49 mV
A	Minimum	Whole trace	2.047 V	1.974 V	2.058 V	1.989 V	23.92 mV

Exercise E2



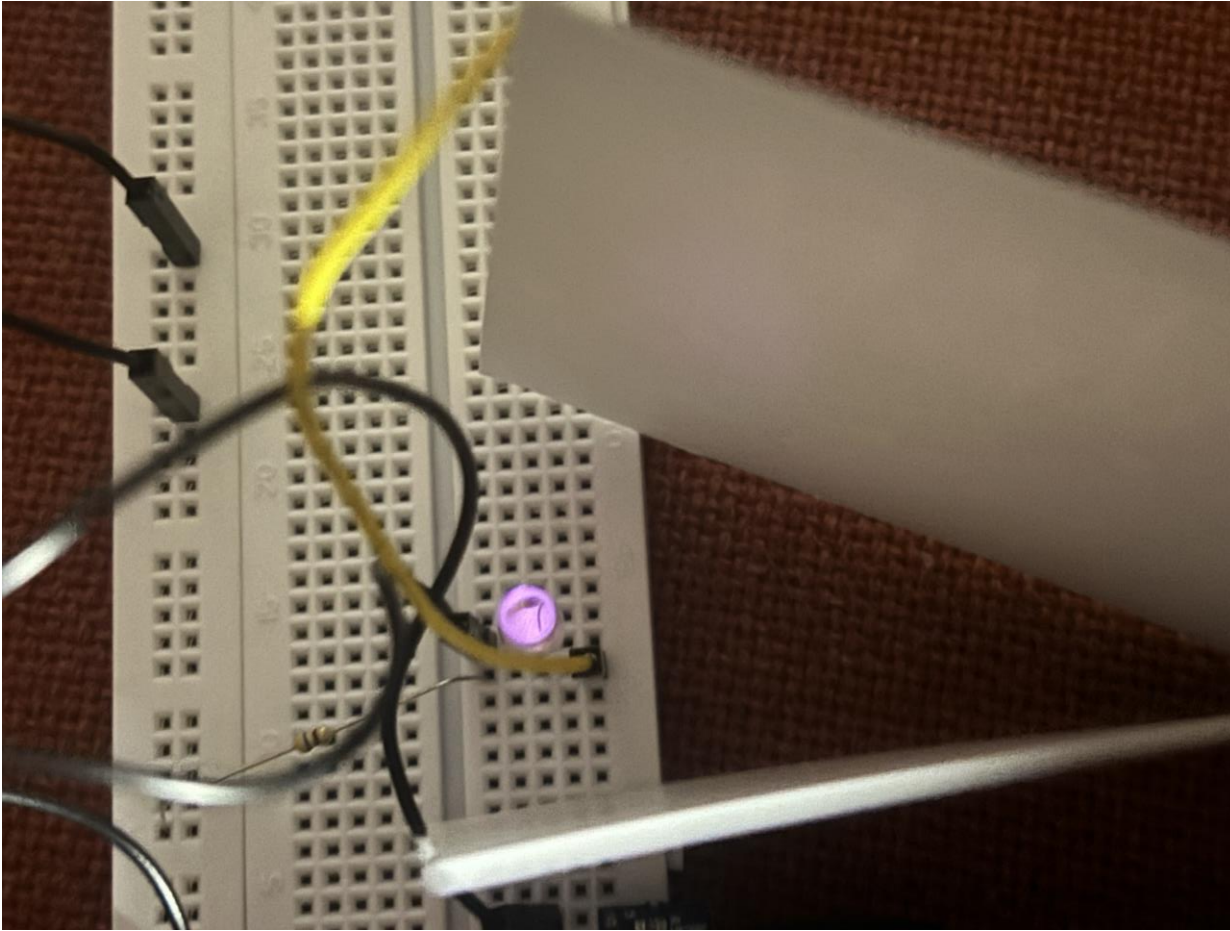
- Red LED:
- $V_{fd} = 1.875V$
- Presumably the forward voltages are different due to the materials of different diodes being different, especially between the light emitting ones and the none-light-emitting ones.

Exercise E2



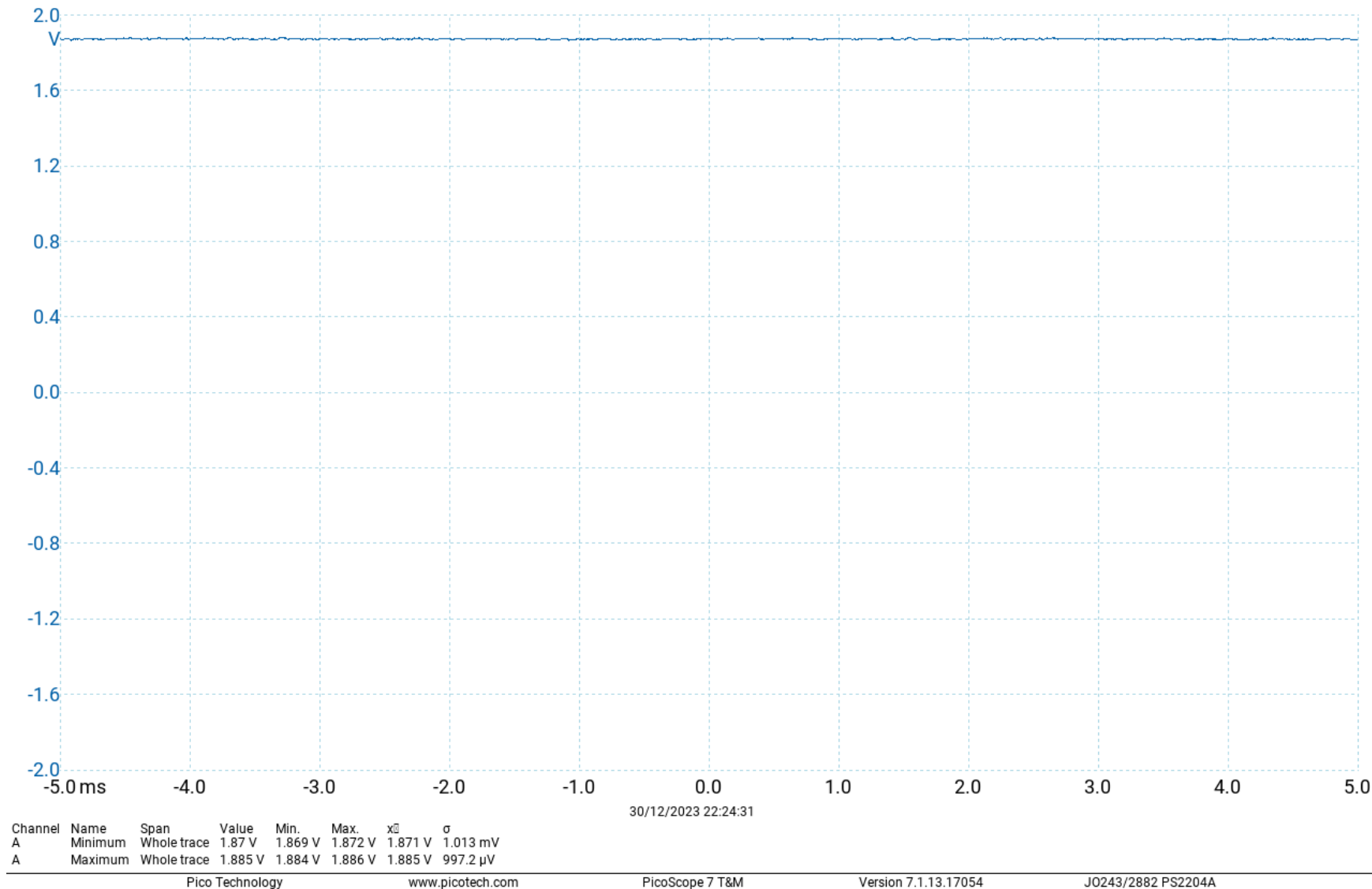
- Infrared Red LED:
- $V_{fd} = 1.260V$

Exercise E2



- Infrared light can be seen with phone cameras
- The photo in the left is taken with most light sources turned off and the only light source blocked by a Christmas card – It seems like removing all light sources will make the photo blurry

Exercise E2



- $V_{fd} = 1.877V$
- $I_{tot} = 6.645mA$
- Both diodes are darker than being alone, which is expected, since the voltages across them decreases from the nearly halved resistance caused by parallel.
- Nothing else seem to change significantly.