W5HN

North Texas NTMS Microwave Society

4 of N Projects
plus
odds and ends

N5BRG

June 4, 2022

In Person and Virtual Meeting

Meteor Camera

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- Setup a low cost camera to monitor sky.
  - 24/7 but data only collected at night.
- Using Sony IMX291 camera $38
  - Very good low light sensitivity
  - Running 720p at 2 mega pixels
    - Low resolution to reduce memory and CPU time
    - Generates 10G to 12G of data per night
- Operates on a Raspberry Pi 4 + Large SD card

The Camera

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AliExpress | Okaidi Security Store | + Follow | 99.2% Positive feedback | 519 Followers | I'm shopping for... | On AliExpress

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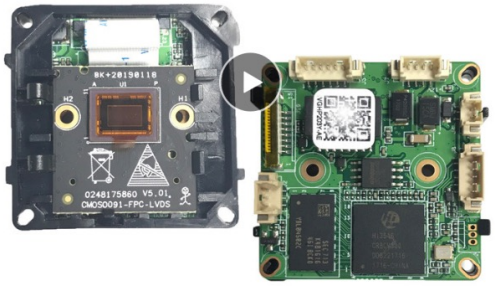
HISILICON Star-Light illumination

Hisilicon Chipset IP Camera Module

Hi3516CV300 + IMX291



IVG-HP203Y-AE

1080P WDR 1920*1080@25FPS

Xm Webcam Wdr Full Hd 1080P Sony Imx291 Hi3516Cv300 Ip Camera Module Ic see Motion Detection Mobile Monitoring Video Surveillance

★★★★★ 5.0 | 26 Reviews | 123 orders

US $37.56 - 43.72

Sensor Size: only module | with 12V cable | with 48V POE cable

Focus: 2.8mm | 3.6mm | 6mm | 8mm | 1.7mm | No Lens

Quantity: 1 | 5585 Pieces available

Ships to United States

Free Shipping

From China to United States via AliExpress Standard Shipping

Estimated delivery on Jun 27 | More options

Buy Now | Add to Cart | 106

75-Day Buyer Protection

Money back guarantee

Example from working camera Captured by: William Wallace in New Mexico

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Example from working camera Captured by: William Wallace in New Mexico

Mark McIntyre (UK) 2021Perseids "Stacked Image"

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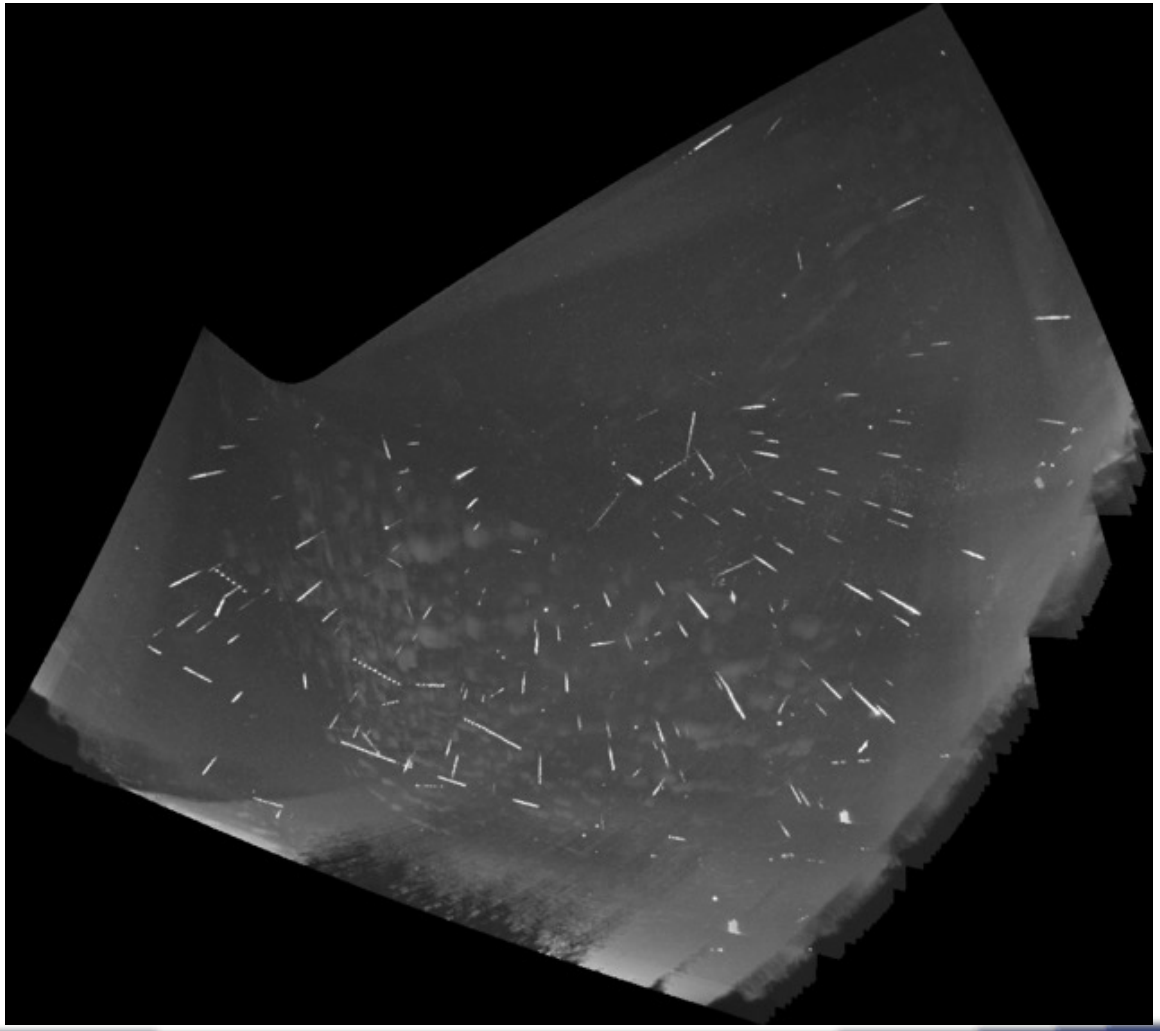

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Antenna Farm

- Adding a collection of antennas
  - Put up four mast for VHF/UHF and Dipoles
  - Dipoles will be used for Radio Astronomy, Radio Jove and WWV Propagation (Space Weather)
  - Installing power and Network
  - Plan to install 5 meter dish and possibly a 1 meter dish with Az and El Control
    - EME and Radio Astronomy
- Remote operation/automatic including Az El motor control
- Fiber Optic Data link for network

Swing Pole Mast Radio/Equipment Cabinet

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Fiber Optic Backbone

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Ran pipe and pulled Fiber Cable
to new antenna area.

- 62.5 um fiber Multi Mode
- Installed connectors
- Tested with Fiber to RJ45 converter - Working

MC200CM

TP-Link Gigabit SFP to RJ45 Fiber Media Converter

10 MHz Reference Oscillator

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- Completed PCB and added components
- Initial testing shows power supply is working and PLL not working.
- Will probably redesign to replace PLL due to Obsolescence. Originally used because it did not require programming.

Reference Oscillator Goals

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- Stable reference oscillator
  - Low or reasonable cost
  - Frequency stability, Jitter, Phase Noise
  - What is possible
  - What is good enough
- Remote operation is important should be small and quick (known wait time) to be on frequency.

Classical GPS Discipline Oscillator

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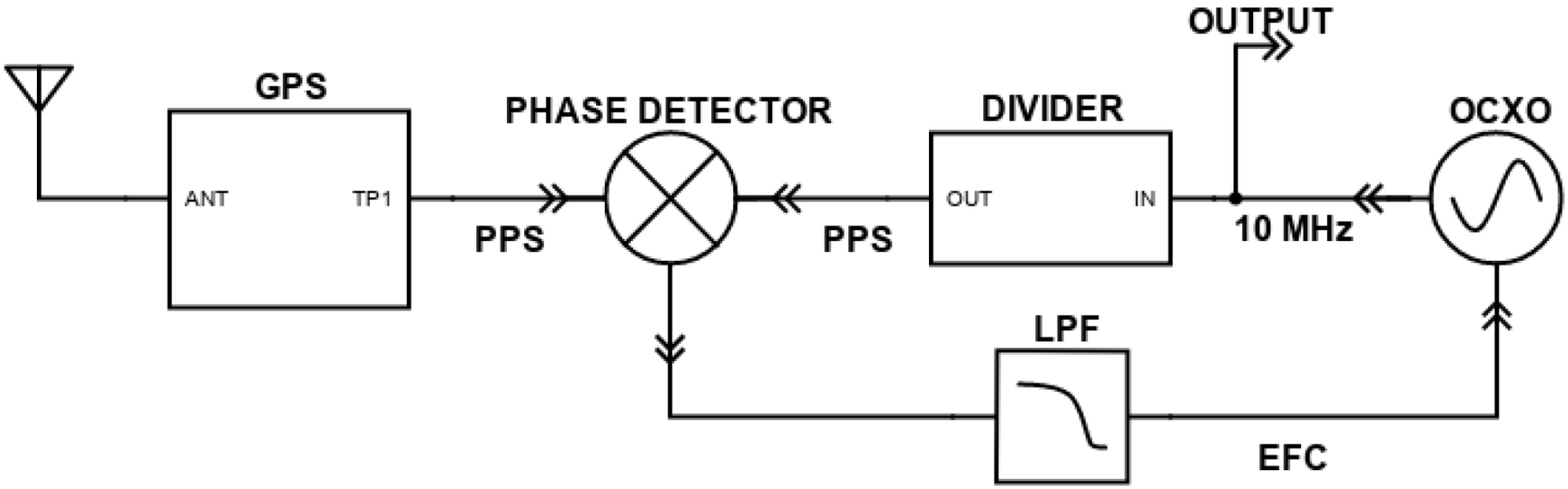

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10 MHz Reference Schematic

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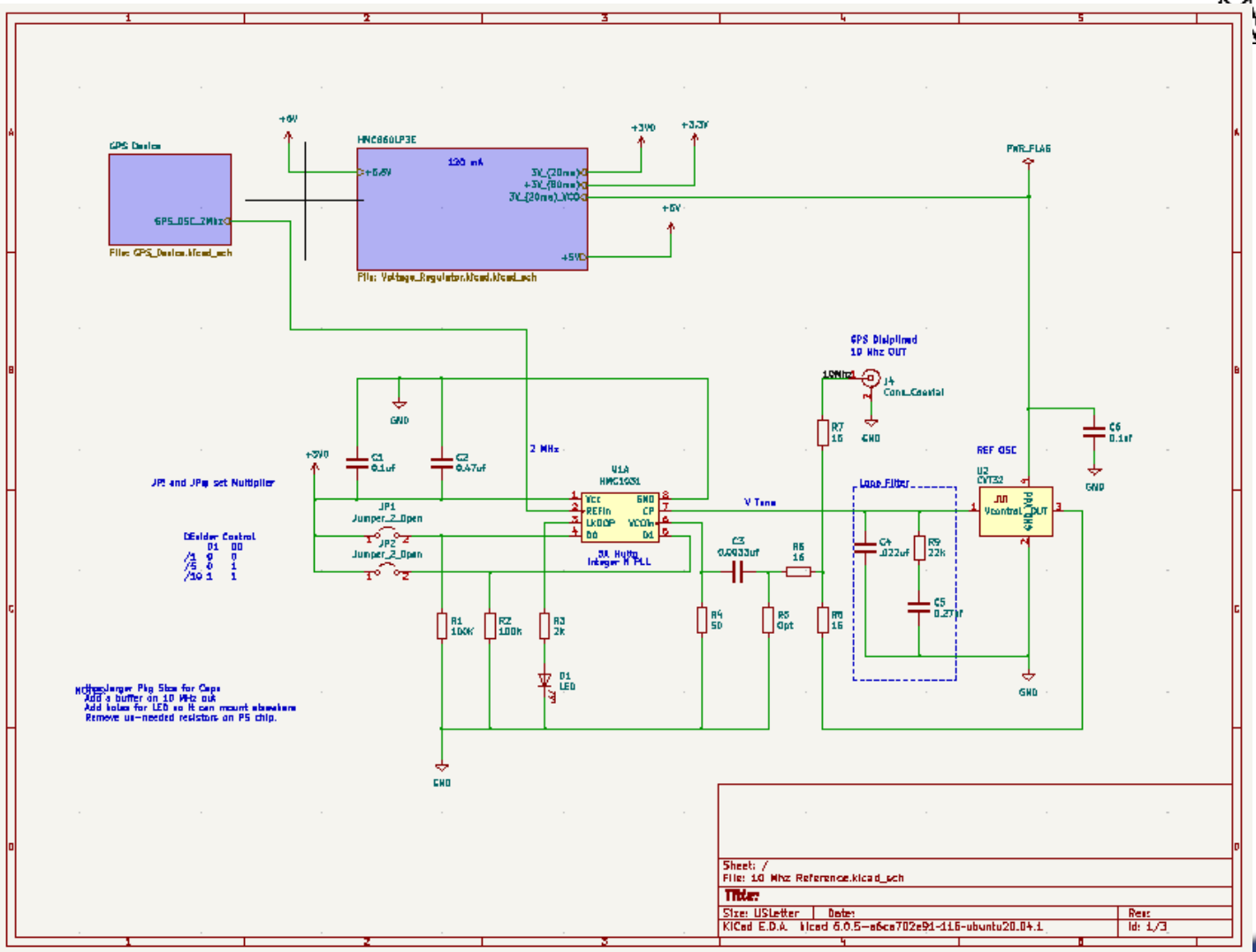

Power Supply
Analog Devices HMC860LP3E

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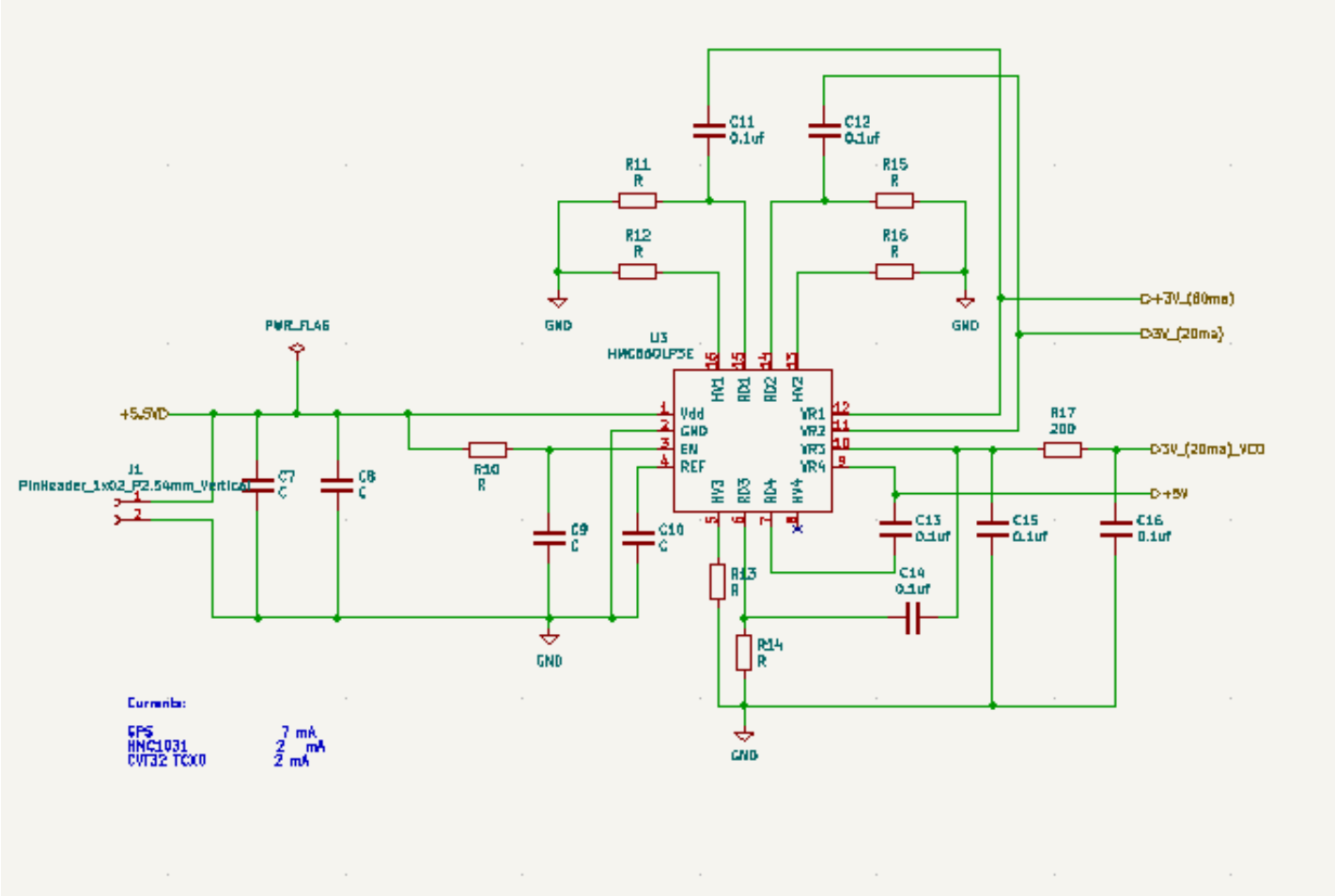

GPS Interface
3 Volt to RS232 Translation

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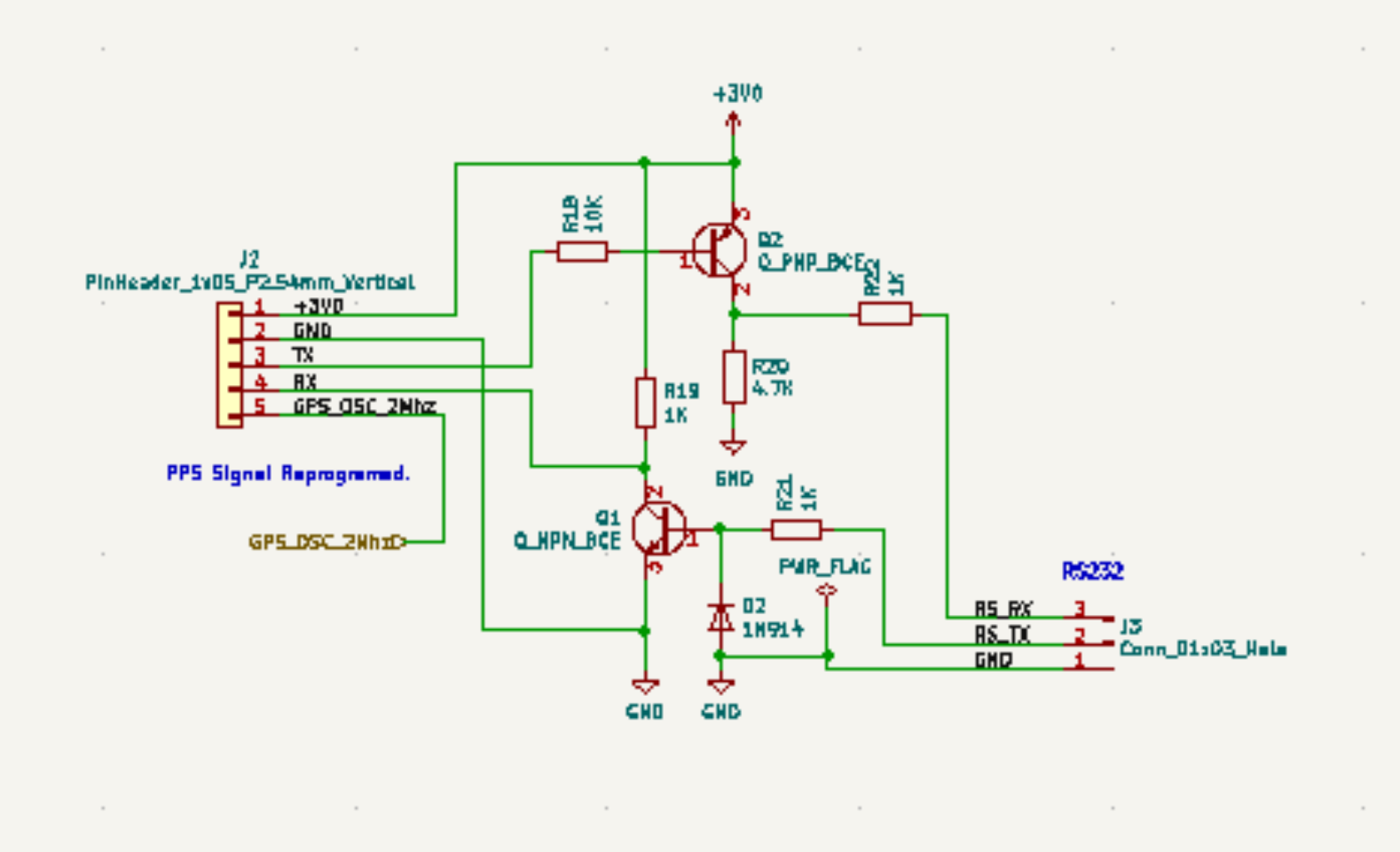

10 MHz GPS Ref

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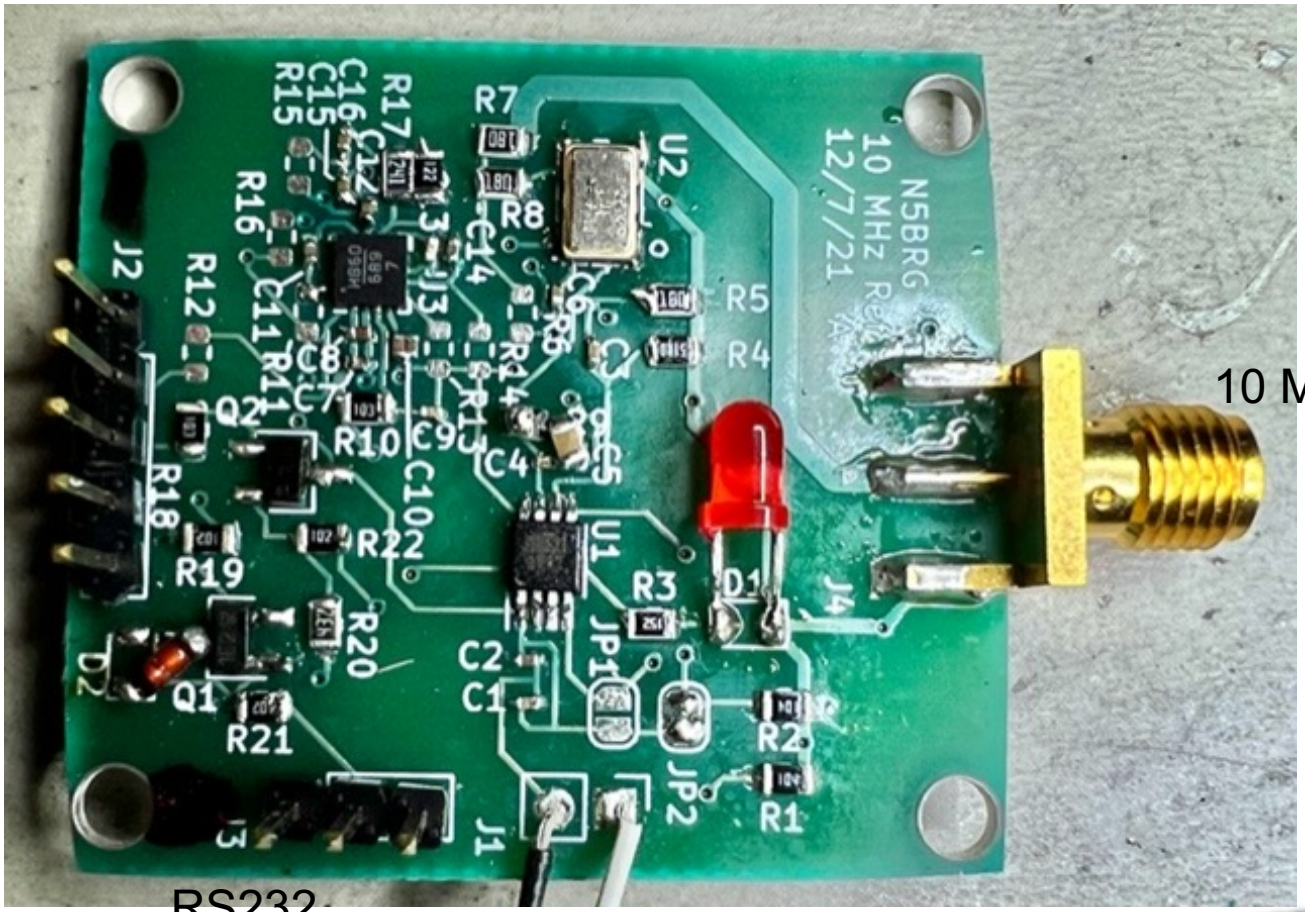
GPS



10 MHz

RS232

Time/Frequency Sources

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Standard	Resonator	Date of Origin	Timing Uncertainty (24 h)	Frequency Uncertainty (24 h)
Quartz crystal	Quartz crystal	1927	10 μs	1×10^{-10}
Rubidium gas cell	^{87}Rb resonance (6,834,682,608 Hz)	1958	100 ns	1×10^{-12}
Cesium beam	^{133}Cs resonance (9,192,631,770 Hz)	1952	1 ns	1×10^{-14}
Hydrogen maser	Hydrogen resonance (1,420,405,752 Hz)	1960	1 ns	1×10^{-14}
Cesium fountain	^{133}Cs resonance (9,192,631,770 Hz)	1991	100 ps	1×10^{-15}
HF Radio (3 to 30 MHz)	HF receiver and antenna		1 to 20 ms	10^{-6} to 10^{-9}
LF Radio (30 to 300 kHz)	LF receiver and antenna		1 to 100 μs	10^{-10} to 10^{-12}
Global Positioning System	GPS receiver antenna		<20 ns	$<2 \times 10^{-13}$

https://tf.nist.gov/general/pdf/1498.pdf

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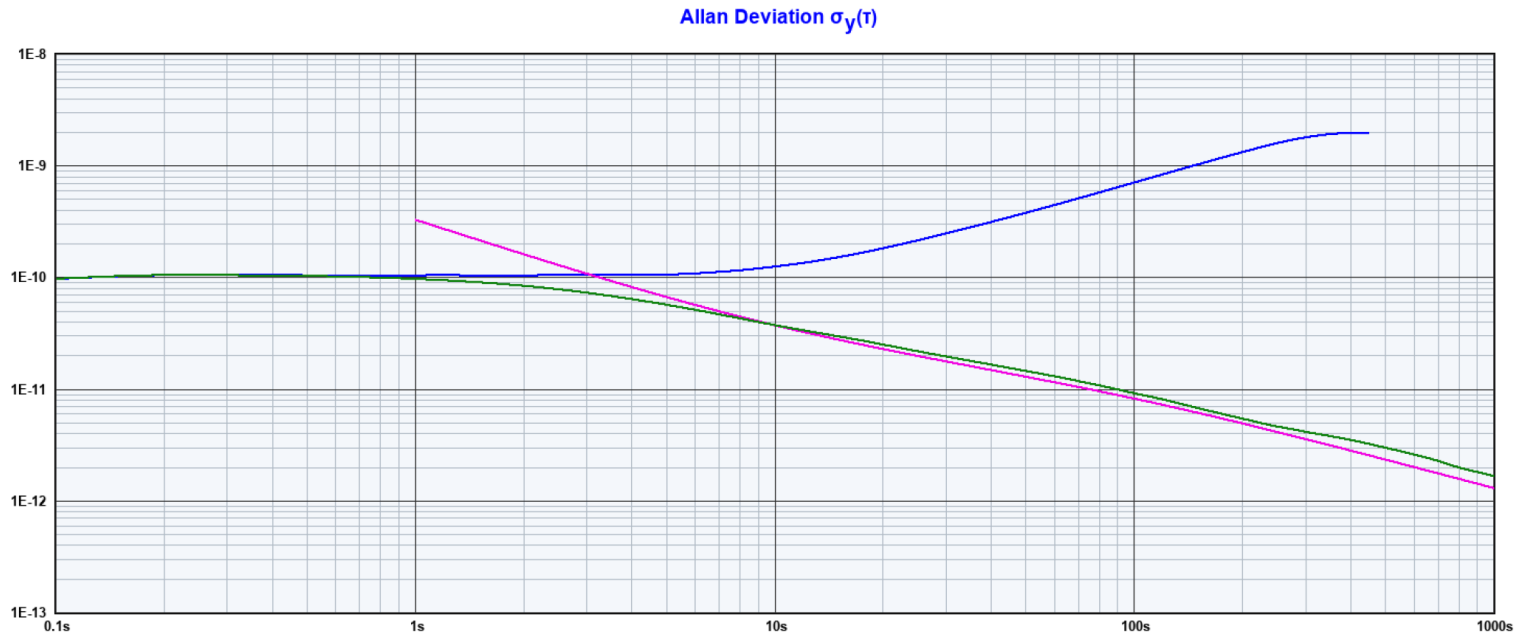
GPSDO – The Result



Trace	Notes	Input Freq	Sample Interval	Duration	Instrument
Vectron TCXO (Unsaved)	vs. Maser	50.000 MHz	0.100 s	30m 0s	Microchip 53100A
ZED-F9T Corrected PPS (Unsaved)	vs. Maser	1 Hz	1 s	18h	TICC
EVB/ZED-F9T 4096kHz/100mHz (Unsaved)	vs. Maser	122.88 MHz	0.100 s	18h	Microchip 53100A

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TAPR - Tangerine -Time Nuts

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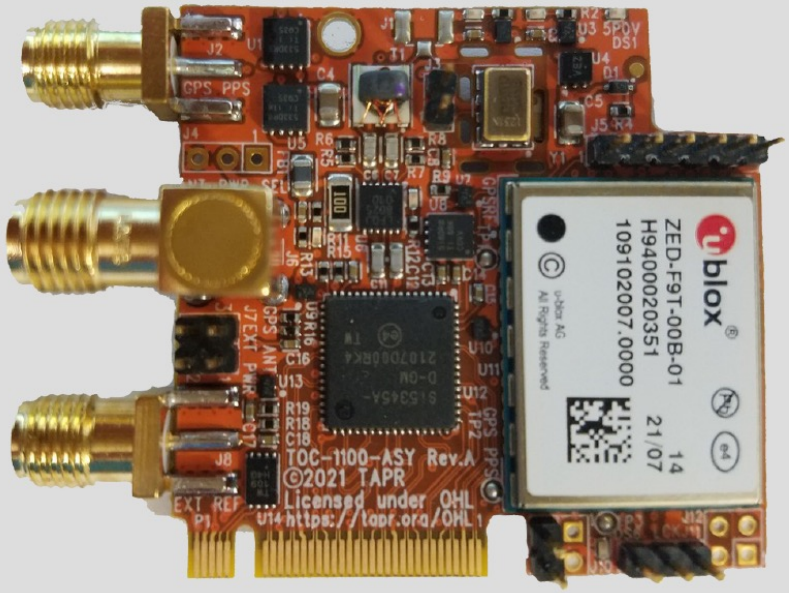

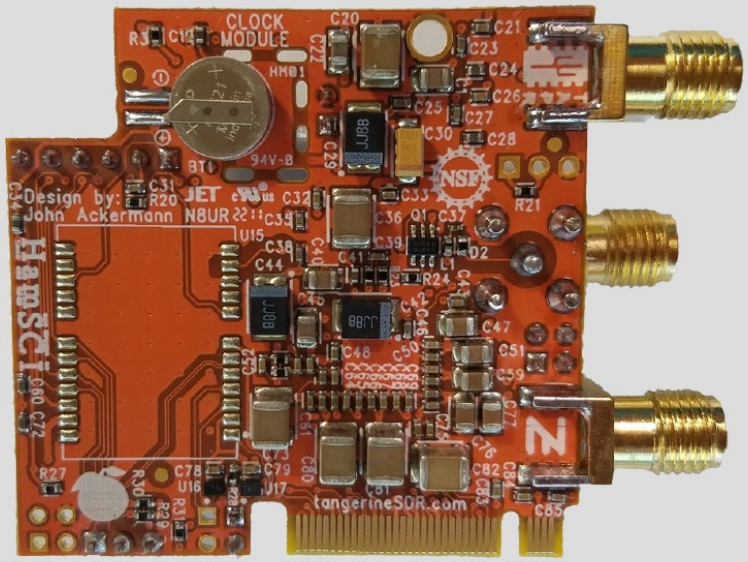

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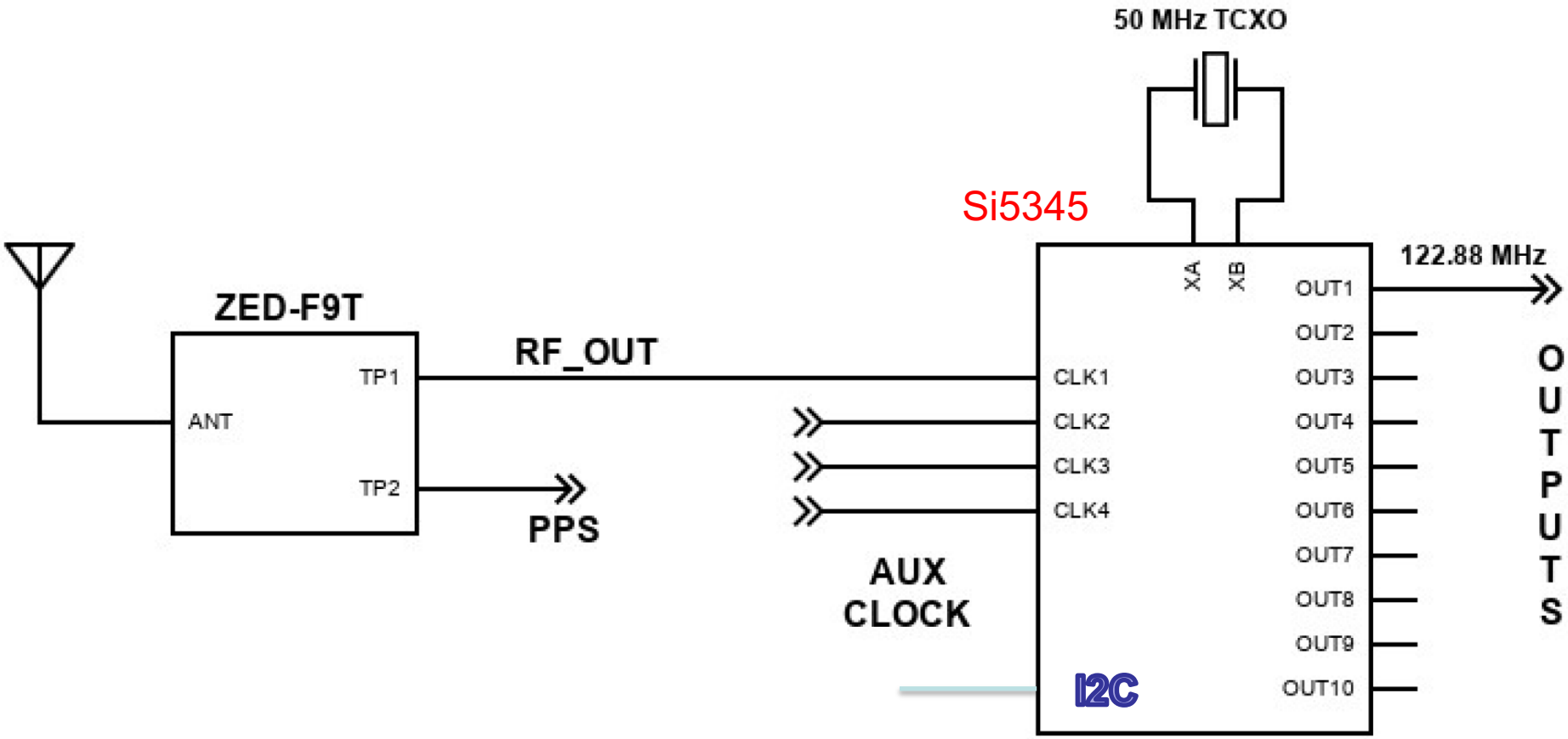
Ref OSC TAPR Approach



Time Nuts Design will output frequencies on all possible outputs.

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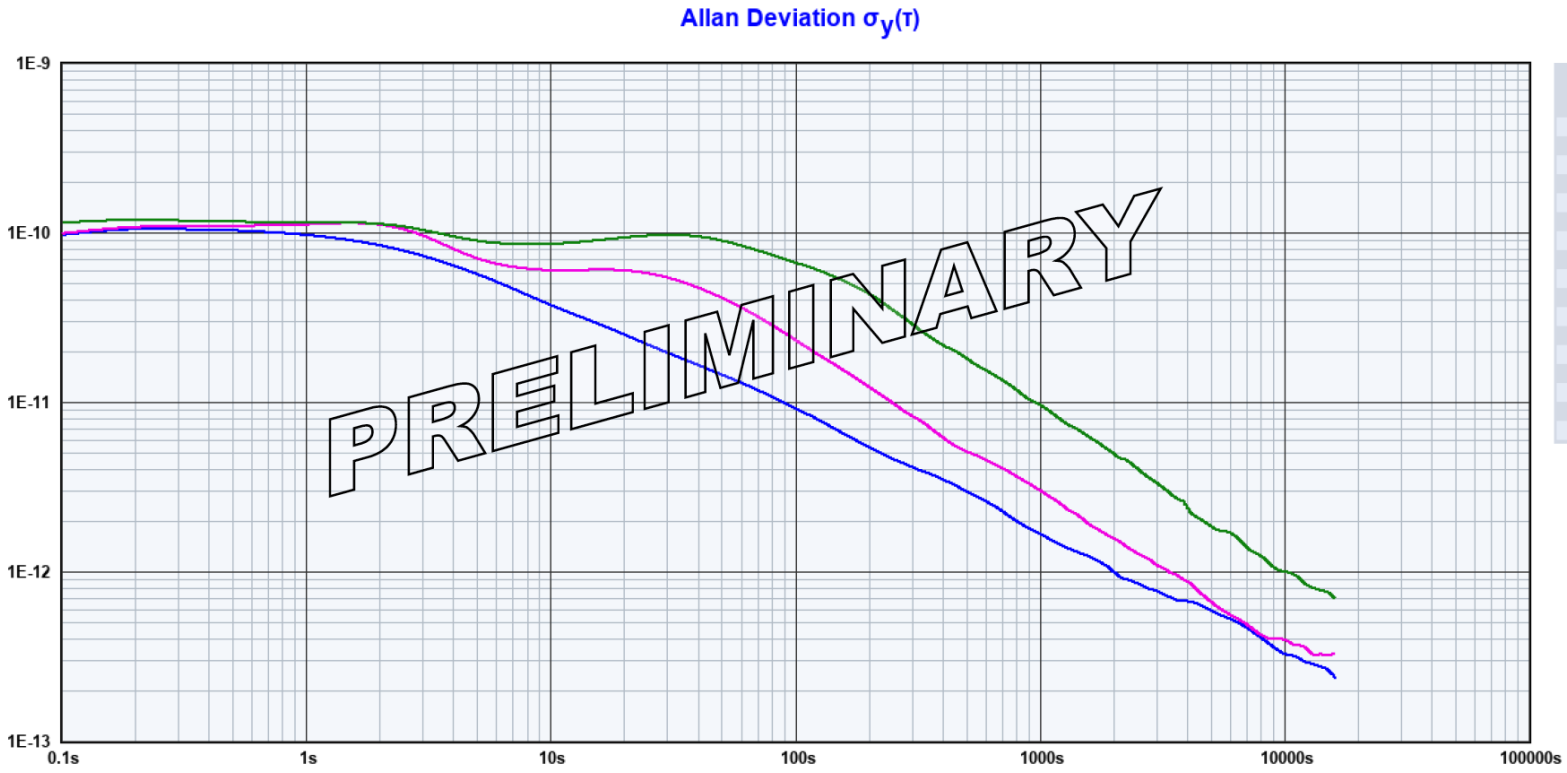
Short Term Stability



Tau	Sigma(Tau)
1s	1.16E-10
2s	1.13E-10
4s	9.58E-11
8s	8.58E-11
10s	8.65E-11
20s	9.45E-11
40s	9.57E-11
80s	7.45E-11
100s	6.71E-11
200s	4.40E-11
400s	2.19E-11
800s	1.19E-11
1000s	9.71E-12
2000s	5.01E-12
4000s	2.37E-12
8000s	1.25E-12
10000s	1.01E-12

Trace	Notes	Input Freq	Sample Interval	Duration	Instrument
EVB/ZED-F9T 4096kHz/100mHz	Maser	122.88 MHz	0.100 s	18h	Microchip 53100A
EVB/NEO-M8T 4096kHz/100mHz	Maser	122.88 MHz	0.100 s	18h	Microchip 53100A
EVB/NEO-M9N 4096kHz/100mHz	Maser	122.88 MHz	0.100 s	18h	Microchip 53100A

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Lime SDR Box

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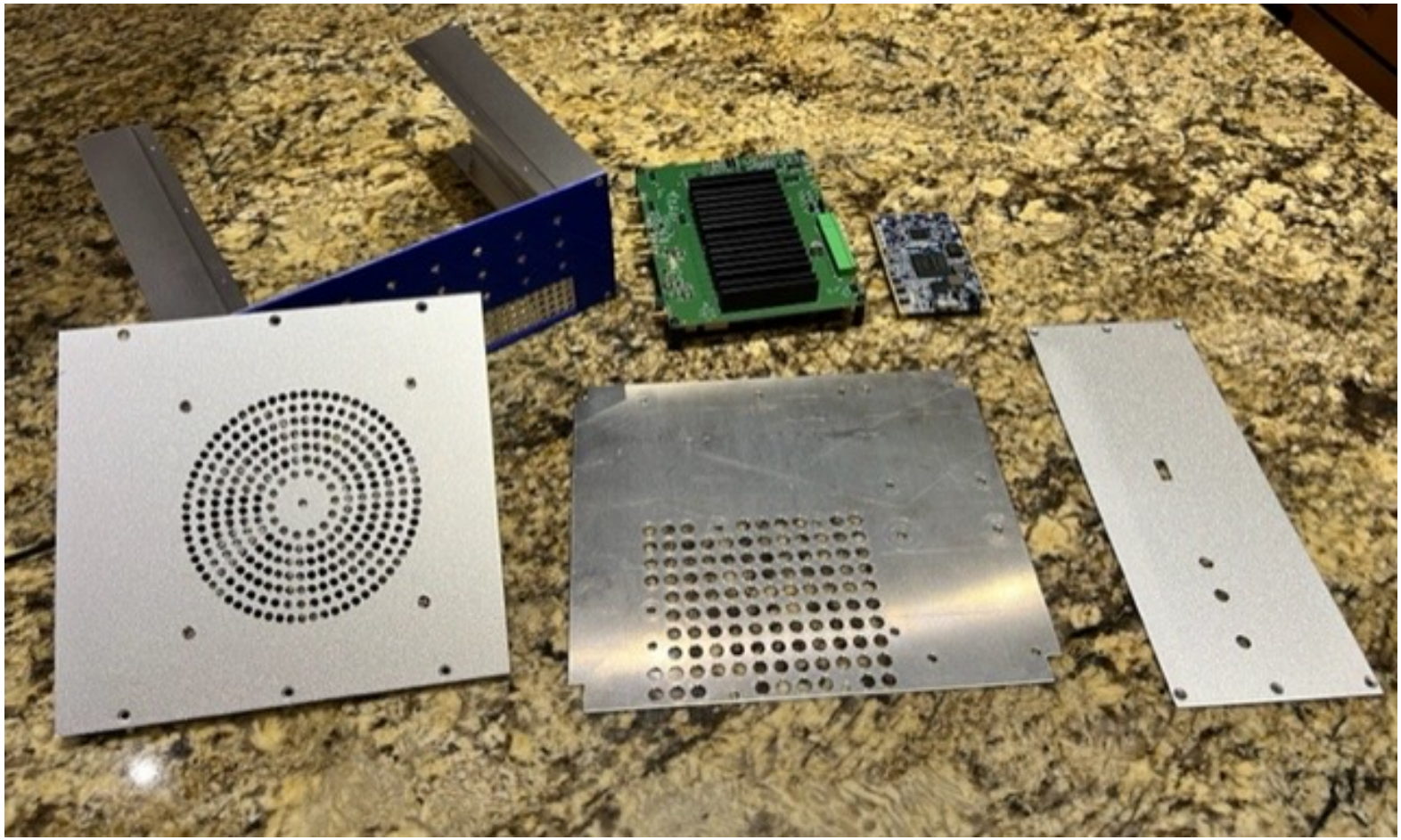

Interesting New Products
ADL5960

ADL5960: 10 MHz to 20 GHz, Integrated Vector Network Analyzer Front End

- Provides both phase and power measurements of waveforms travelling in forward and reverse directions along a transmission line
- Wideband integrated bidirectional bridge with IF frequency offset mixer with input divider ratio 1, 2, or 4
- Phase synchronized measurement across multiple devices (ports)
- SPI-configurable LO interface

ADL5960 Test Circuit

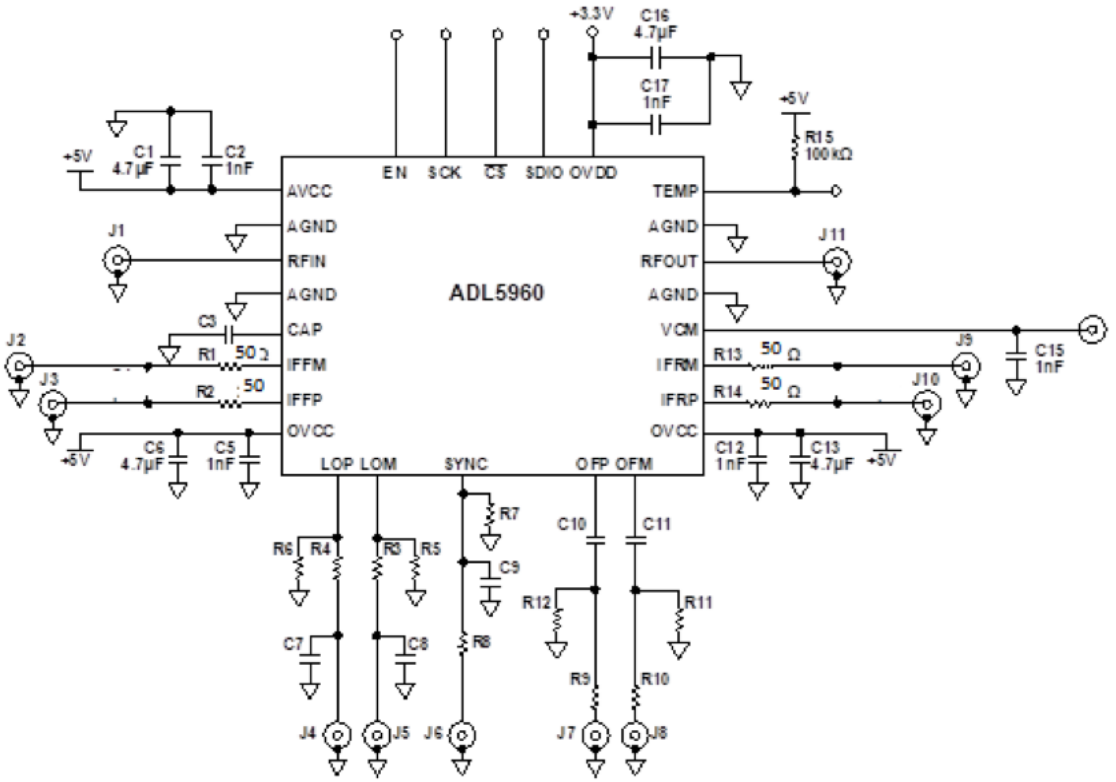

Figure 20. Test Circuit

Interesting New Products
LTC5597

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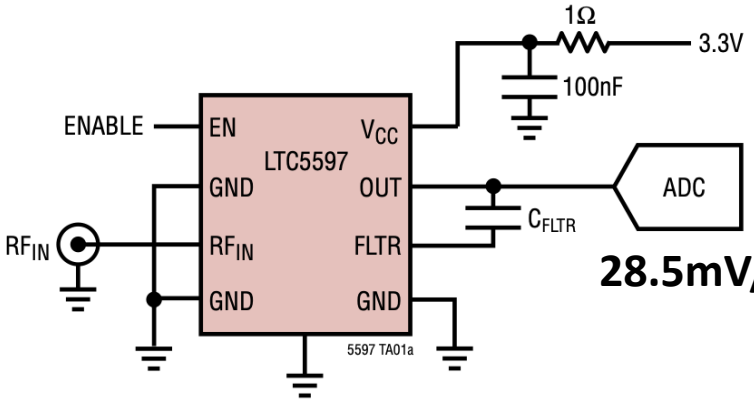
LTC5597: 100 MHz to 70 GHz Linear-in-dB rms Power Detector with 35 dB Dynamic Range

- Ultrawide matched input frequency range: 100 MHz to 70 GHz
- Accurate rms power measurement of high crest factors (up to 12 dB) modulated waveforms
- Low power shutdown mode



28.5mV/dB Logarithmic Slope

Interesting New Products
ADL6012

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ADL6012: 2 GHz to 67 GHz Envelope Detector Capable of Measuring up to 500 MHz of Bandwidth

- Input range of −25 dBm to +15 dBm up to 43.5 GHz
- Flat frequency response with minimal slope variation
- ±1 dB error up to 43.5 GHz
- Over 500 MHz wide envelope bandwidth

FUNCTIONAL BLOCK DIAGRAM

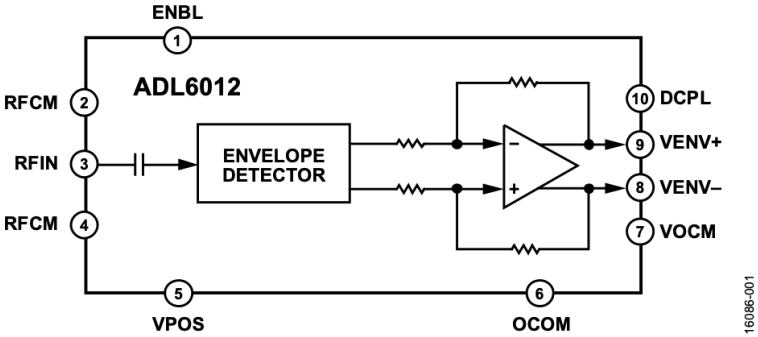

Figure 1.

Analog Devices' RF and microwave components are now also available as X-MWblock® drop-in evaluation modules from X-Microwave.

Get the X-MWblock® drop-in module for this part.