



Matchstiq X40

High Performance

Space-Based Missions

Spectrum Dominance

Small Form Factor

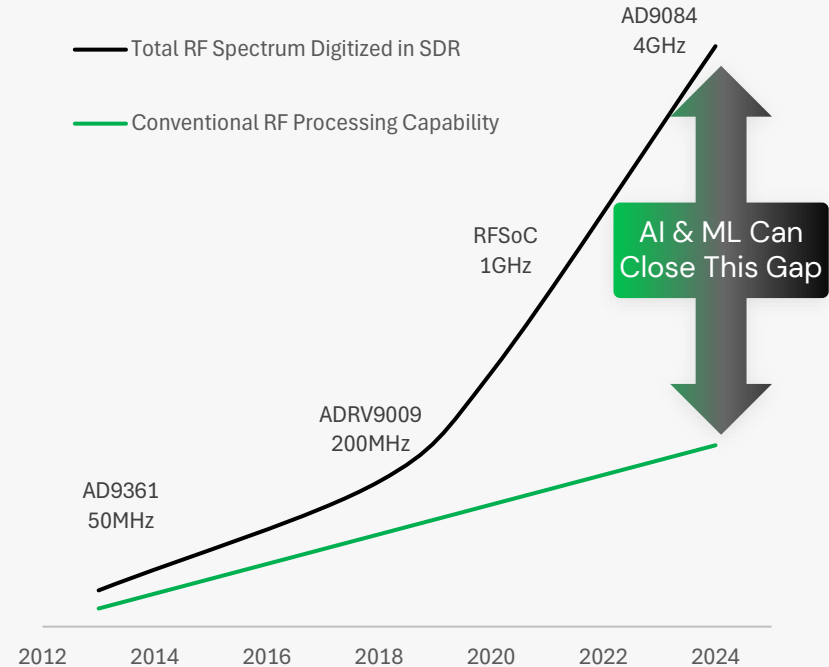
Open Architecture

Enabling AI & ML at the RF Edge



RF Digitization is Outpacing Signal Processing

- The Last Decade has Seen an Exponential Growth in SDR Capability
 - Nearly 200x Increase in RF BW per SDR
- Conventional Signal Processing Has Not Kept Up
 - Moore's Law → Linear Growth, Not Exponential
- Epiq's Approach: **Embrace AI & ML**
 - Integrate Highly Capable GPU/CPU Devices into the SDR
 - Enable Power Scalable Processing
 - Partner with Industry Leaders like DeepSig
- The Result
 - Industry Leading SDRs Optimized for RF Sensing at the Edge



Matchstiq G20, G40, and X40



Scalable Product Family for AI & ML Applications

- Increasing RF Coverage, BW, and Processing with SWaP-C
- Two Form Factors
 - G20/G40: 7.6" x 4.4" x 1.0" & 2lbs
 - X40: 9.75" x 4.25" x 1.45" & 2.2lbs

G20

One NV100 SDR
2TB SSD for Record
Nvidia Orin NX 16G
2 RF Ports
Coherent & Independent
20W Typical

G40

Two NV100 SDRs
Nvidia Orin NX 16G
4 RF Ports
Coherent & Independent
30W Typical

X40, 6GHz

1MHz – 6GHz RF Range
Up to 200MHz BW / Ch
4 Receivers
2 Transmitters
Coherent & Independent
Nvidia Orin NX 16G
AMD ZU7 MPSoC
45W Typical

X40, 18GHz

1MHz – 18GHz RF Range
Up to 450MHz BW / Ch
4 Receivers
1 Transmitter
Coherent & Independent
Nvidia Orin NX 16G
AMD ZU7 MPSoC
60W Typical



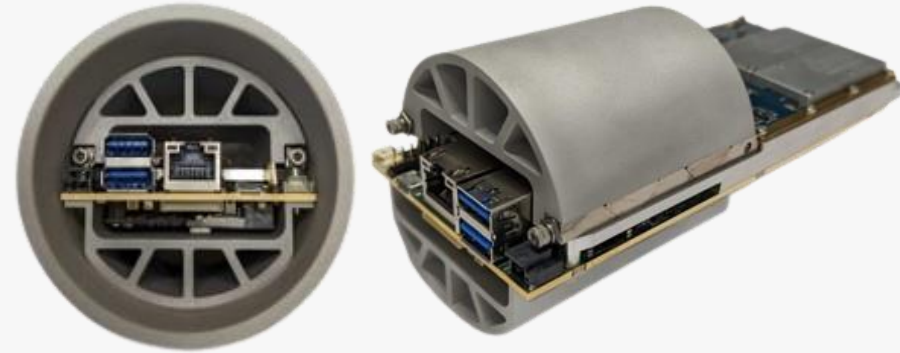
Matchstiq X40 & Cylinder Payload



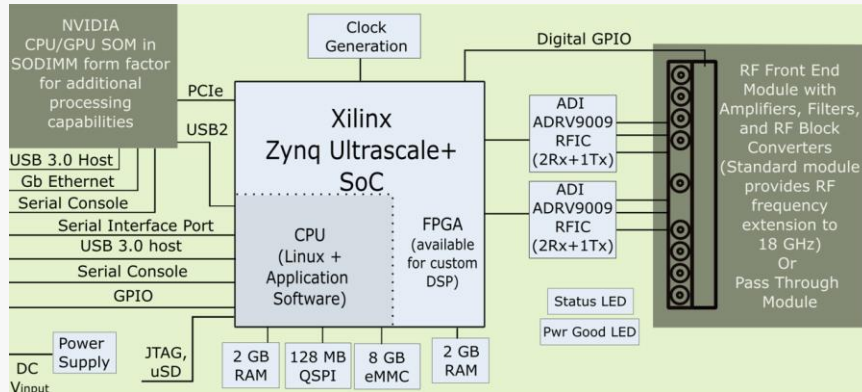
Expendable SDR Platform Funded by ONR

- Extremely Low SWaP-C, Targeted as Disposable Maritime Use
- CPU + GPU + FPGA + SDR + RF
- Fits in a 2.8" Diameter Cylinder
- RF Coverage 1MHz – 18GHz
- 2 Receiver Channels & 1 Transmit Channel
 - Upgrade to 4 Receivers for X40
- Up to 450MHz Bandwidth Per Channel
- NVIDIA Orin NX 16G CPU/GPU Module for Signal Processing

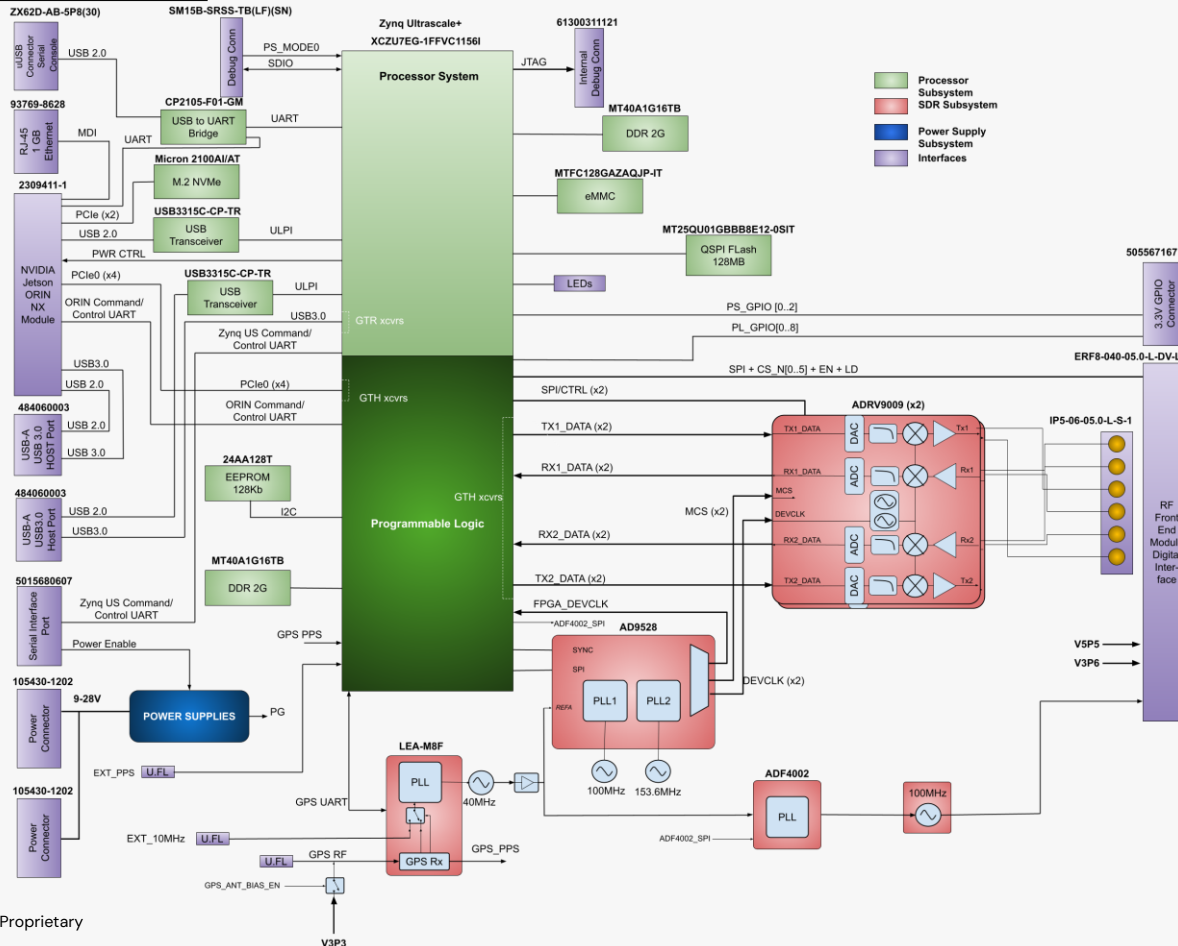
X40 Cylinder



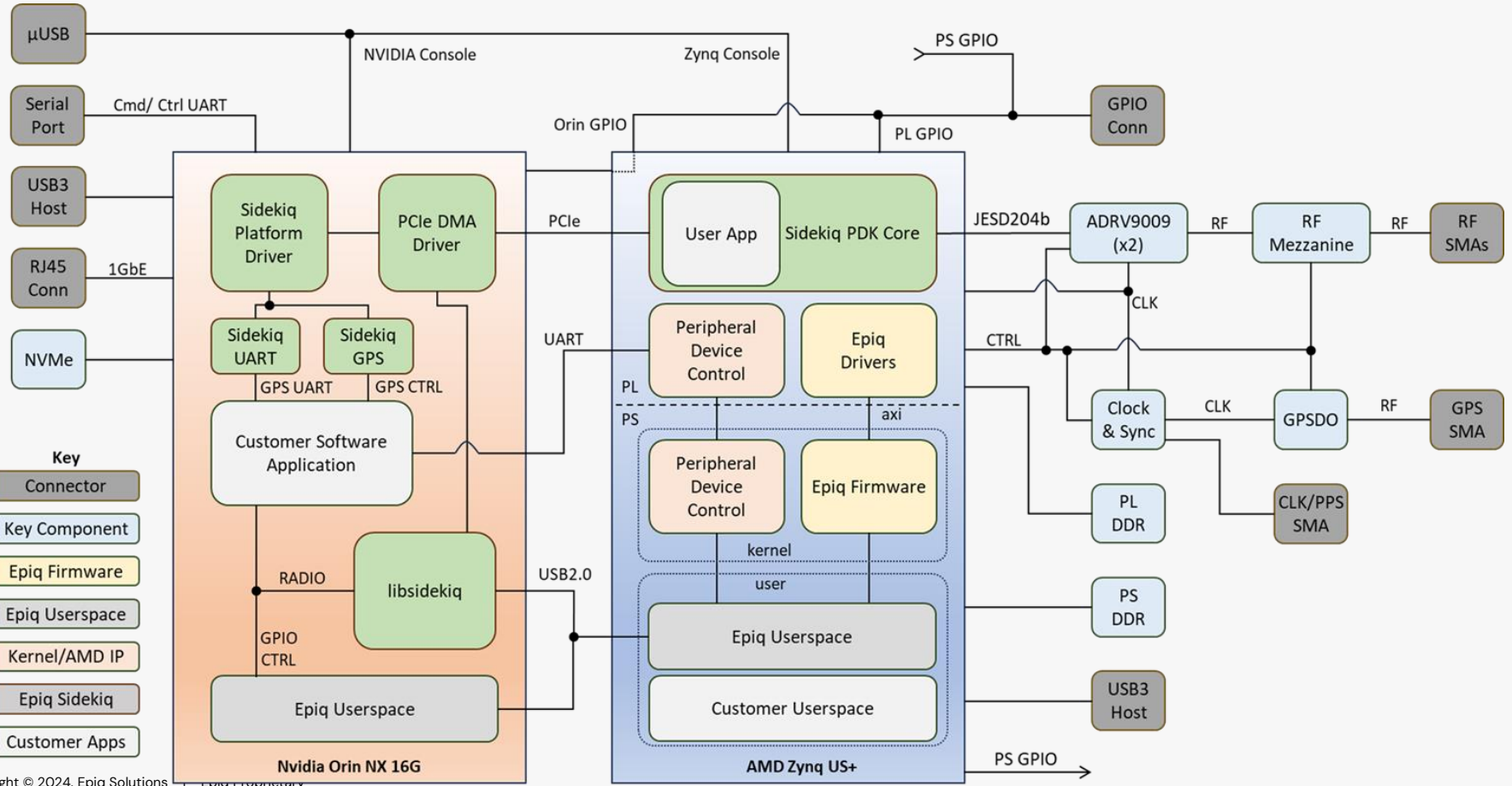
Matchstiq X40



Matchstiq X40 Detailed Block Diagram



Matchstiq X40 Detailed Software & Interface Diagram



X40 Mode Table – 4R2T 6GHz Mezzanine



Configuration	Description	RFIC_A	RFIC_B	Max Bandwidth Per Rx Channel
2R2T Coherent Mode	2Rx and 2Tx Channels All Channels Coherent Across All Frequencies	RX2 & Tx1 Enabled LO_A = FreqA	RX2 & TX1 Enabled LO_B = FreqA	200MHz
		ORX1 & Tx1 Enabled LO_A = FreqA	ORX1 & TX1 Enabled LO_B = FreqA	450MHz
Two 1R1T Pairs	2Rx and 2Tx Channels Each Coherent 1R1T Pair Tunes Independently	RX2 & Tx1 Enabled LO_A = FreqA	RX2 & TX1 Enabled LO_B = FreqB	200MHz
		ORX1 & Tx1 Enabled LO_A = FreqA	ORX1 & TX1 Enabled LO_B = FreqB	450MHz
4R2T Coherent Mode	4Rx and 2Tx Channels All Channels Coherent Across All Frequencies	RX1, RX2 & Tx1 Enabled LO_A = FreqA	RX1, RX2 & TX1 Enabled LO_B = FreqA	200MHz
Two 2R1T Pairs	4Rx and 2Tx Channels Each Coherent 2R1T Pair Tunes Independently	RX1, RX2 & Tx1 Enabled LO_A = FreqA	RX1, RX2 & TX1 Enabled LO_B = FreqB	200MHz

X40 Mode Table – 4R1T 18GHz Mezzanine



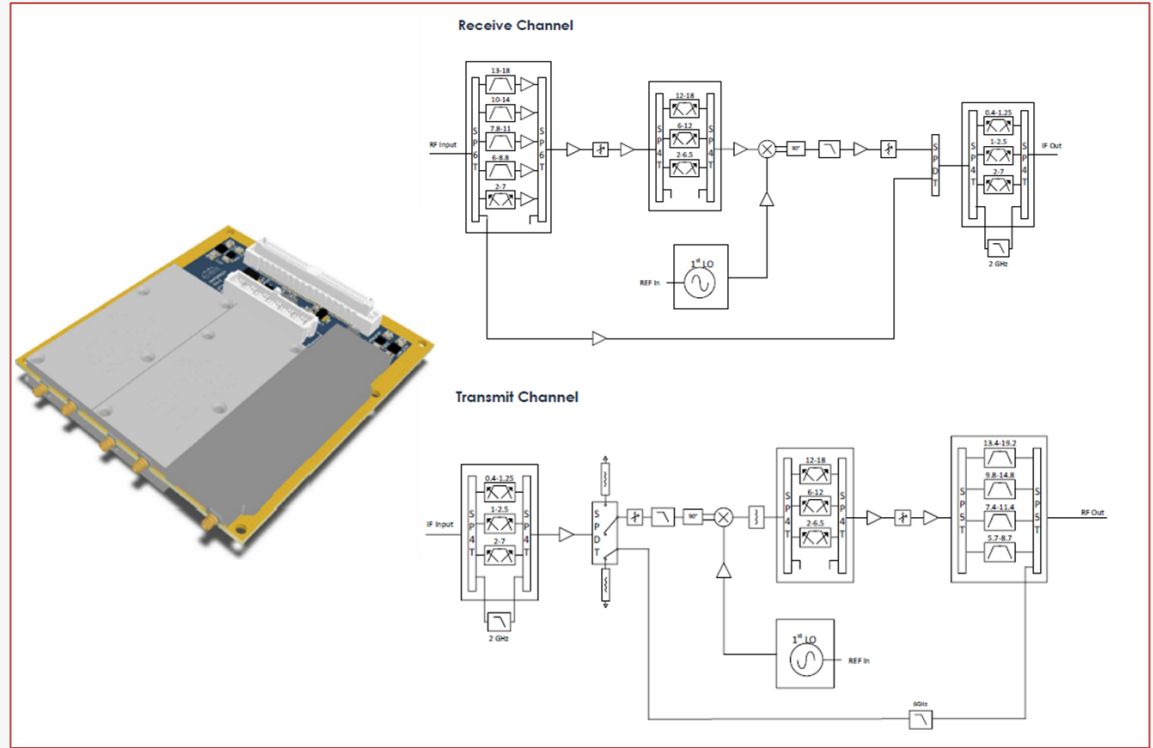
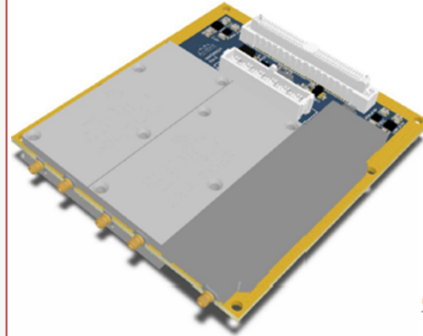
Configuration	Description	RFIC_A	RFIC_B	Max Bandwidth Per Rx Channel
2R1T Coherent Wideband Mode	2Rx & 1Tx Channels All Channels Coherent Across All Frequencies	ORX1, TX1 Enabled LO_A = FreqA	ORX1 Enabled LO_B = FreqA	450MHz
2R1T Independent Wideband Mode	2Rx & 1Tx Channels 1R1T Pair & 1Rx Channel Tune Independently	ORX1, TX1 Enabled ≤6GHz LO_A = FreqA >6GHz LO_A Can Be Independent Per Channel	ORX1 Enabled LO_B = FreqB	450MHz
4R1T Coherent Mode	4Rx & 1Tx Channels All Channels Coherent Across All Frequencies	RX1, RX2, TX1 Enabled LO_A = FreqA	RX1, RX2 Enabled LO_B = FreqA	200MHz
4R1T Independent Mode	4Rx & 1Tx Channels 2R1T Pair & 2Rx Pair Tune Independently	RX1, RX2, TX1 Enabled ≤6GHz LO_A = FreqA >6GHz LO_A Can Be Independent Per Channel	RX1, RX2 Enabled ≤6GHz LO_B = FreqB >6GHz LO_B Can Be Independent Per Channel	200MHz

Matchstiq X40 18GHz RF Mezzanine

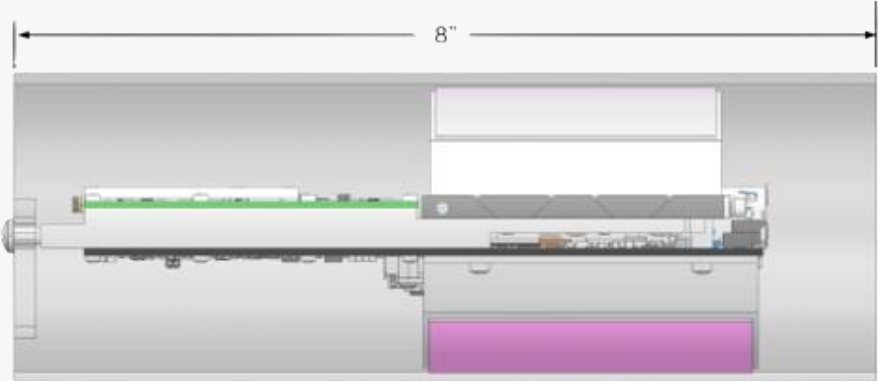
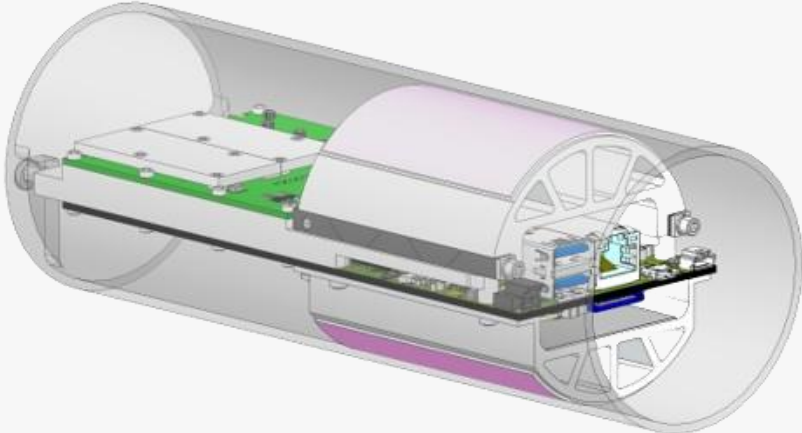


Features

- Quad 6–18GHz Rx Down-Converter
- Single 6–18GHz Tx Up-Converter
- Sub-6GHz Bypass Path for Rx & Tx
- 1GHz Bandwidth
- 3GHz IF Input & Output Frequency
- Sub-Octave Preselection Filters
- Low Power & Sleep Modes
- Channel Disable
- Rx: 5dB \pm 3dB Gain
- Rx: <12dB NF, +5dBm IIP3
- Tx: 5dB \pm 3dB Gain, 0dBm Output
- Tx: +20dBm OIP3
- +3.6V & +5.5V DC Input
- -40 to +70 C Operation
- 3.10" x 2.72" x 0.34"



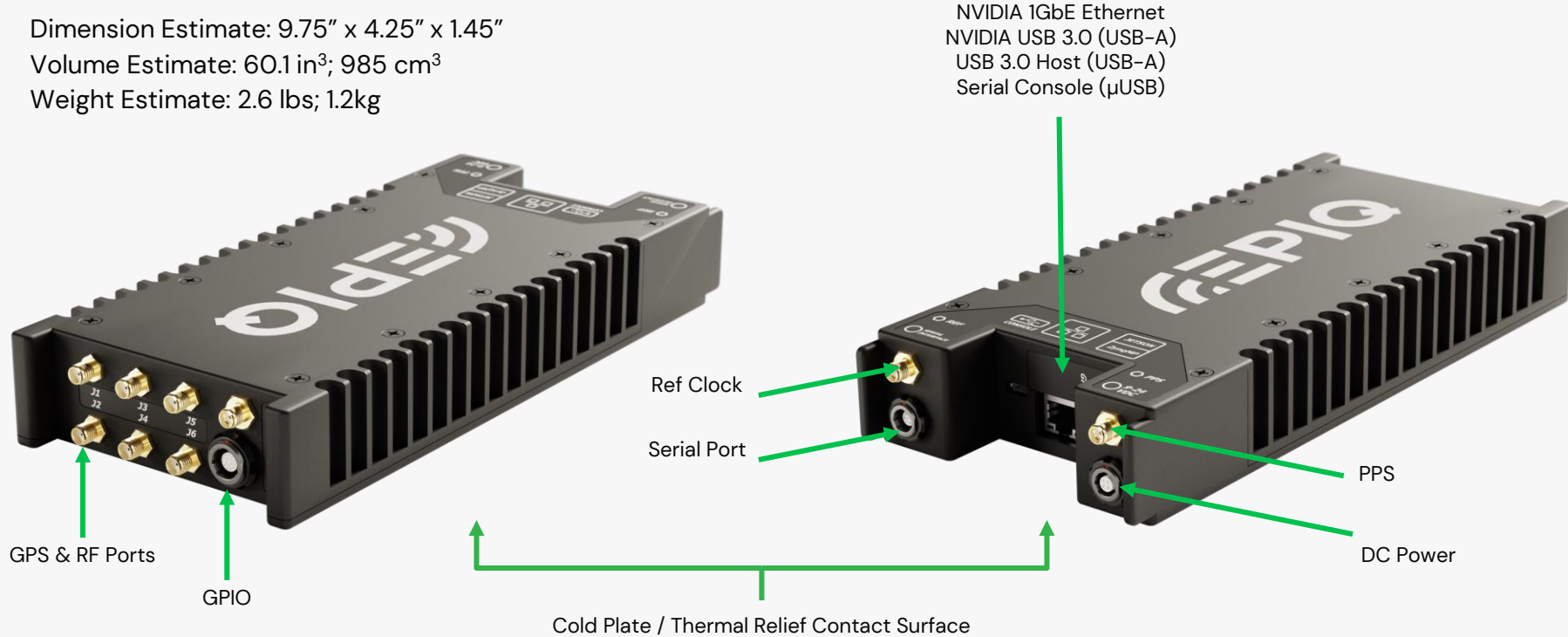
X40 Cylinder Mechanical Diagram



Matchstiq X40 Mechanical Diagram



- Dimension Estimate: 9.75" x 4.25" x 1.45"
- Volume Estimate: 60.1 in³; 985 cm³
- Weight Estimate: 2.6 lbs; 1.2kg



Matchstiq X40 Power Consumption – Config Dependent



Power Impact from Configuration in the Orin NX, FPGA, & RF Mezzanine

- Current Power Estimates for Low SWaP Expendable Mode and High Capability Mode Below

Device	Expendable Mode	High Capability Mode	Comment
RF Mezzanine	9W	15W	2R1T VS 4R1T Impact
ADRV9009s	12W	12W	Minimal Changes in Different Modes
ZU7 FPGA	6W	18W	≤50% Loading vs 100% Loading
Orin NX SOM	6W	18W	≤50% Loading vs 100% Loading
Clocking, IO, etc	3W	4W	Expendable Mode has Reduced IO Payload
Power Distribution	4W	8W	Consistently ~10% Loss in Distribution
Total	40W	75W	Roughly 2x Swing Across Modes

Matchstiq X40 Status



Wrapping Up Design Phase and ONR Contract

Early Units Available in Mid 2024

Product Release in 4Q24

Contact Epiq Solutions for More Information



Thank You

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