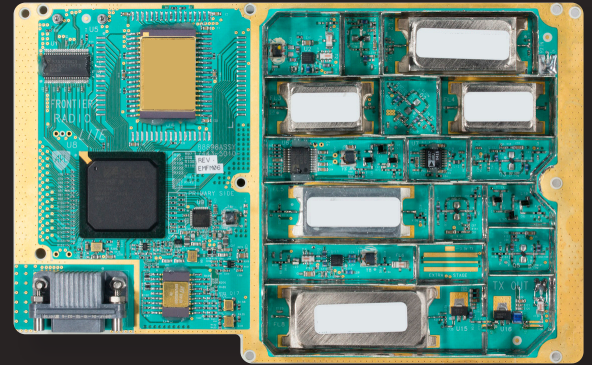
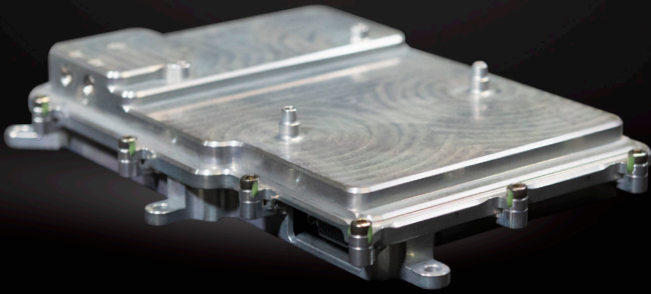


FRONTIER-S

BY ROCKET LAB

A SOFTWARE DEFINED TT&C RADIO

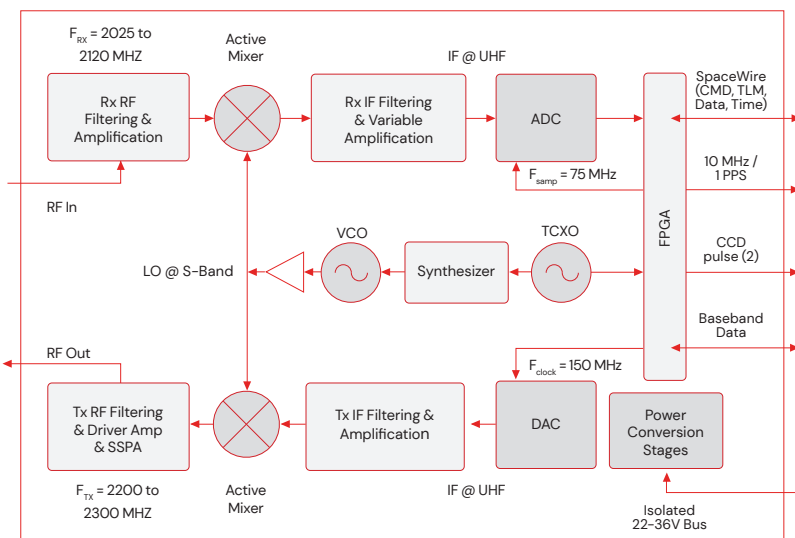


The *Frontier-S* by *Rocket Lab* is a single board, software-defined telemetry, tracking, and command (TT&C) S-band radio designed for both near Earth and deep space missions.

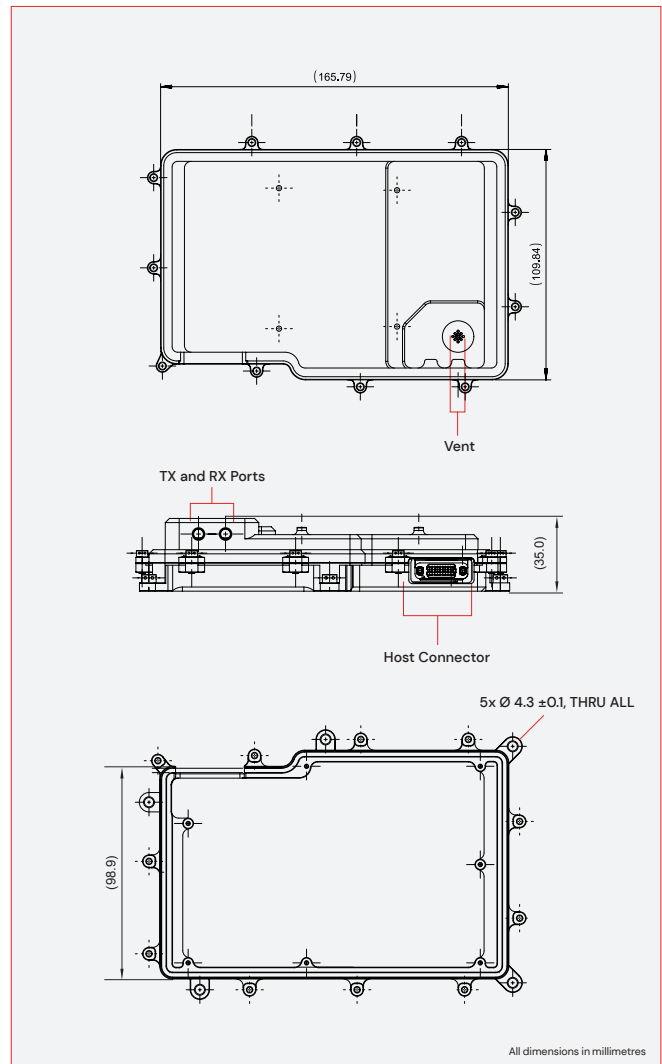
The *Frontier-S* by *Rocket Lab*, based on the Johns Hopkins University (JHU) Applied Physics Lab (APL) Frontier Radio, packs Deep Space Network (DSN) and other typical waveforms (TDRSS, NEN, AFSCN, commercial) into a single board package with up-screened commercial components for high reliability applications. *Frontier-S* by *Rocket Lab* includes extended functionality not typically available in a low-cost radio including a coherent transponder to enable radiometric navigation methods, timekeeping functions and hardware based critical command decoder (CCD).

KEY FEATURES

- + GEO/deep space radiation tolerance – high tolerance to total dose, no destructive latchup, and robust to single event upsets
- + High Reliability variant available with enhanced radiation tolerance and upgraded parts program
- + Hardware critical command decoder (CCD) enables hardware-based functionality like fire-codes for spacecraft reset or precision time keeping
- + DSN, SN, NEN, AFSCN Unified S-band (USB), and commercial (SSC, KSAT) waveform compatible
- + CCSDS compliant turbo and convolutional encoding
- + Two-way Doppler and two-way ranging for navigation beyond low Earth orbit
- + Non-regenerative (coherent turn-around) or regenerative PN ranging
- + Very low data rates and beacon tones enable long range communications and signaling

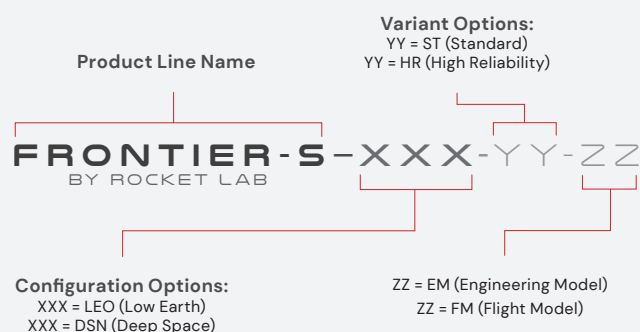


GENERAL SPECIFICATIONS	
ENCLOSURE DIMENSIONS	179.9 mm x 125.4 mm x 35.0 mm
MASS	590 g, based on standard enclosure
BUS VOLTAGE	22 – 35 V, 30 V Nominal
POWER	<3.5 W, Rx only, <6.8 W full duplex with full RF output power
HOST INTERFACE	SpaceWire – ECSS-E-ST-50-12C single port, FPGA LVDS, 10 to 50 MBd
RECEIVER	
FREQUENCY	2020 to 2120 MHz (16 kHz sub-carrier)
NOISE FIGURE	<5.7 dB
IMPLEMENTATION LOSS	<2 dB
TURNAROUND BANDWIDTH	150 kHz to 1.7 MHz
CARRIER SENSITIVITY	-145 dBm
TRANSMITTER	
TX POWER	70 to 700 mW, selectable
FREQUENCY	2200 to 2300 MHz (25 kHz nominal sub-carrier frequency)
PHASE NOISE	<1.2° RMS
FREQUENCY STABILITY	<32 ppb/°C, <1 ppm/year
RF WAVEFORMS	
COMPATIBILITY	DSN, SSC, SN, KSAT, TDRSS-SA
MODULATIONS	PM, BPSK, QPSK, O/SQPSK
RX RATE	100 Bd to 1 MBd
TX RATE	20 Bd to 4 MBd
ENVIRONMENTAL	
RANDOM VIBRATION	GSFC-STD-7000
SHOCK	GSFC-STD-7000
TEMP	-30 to +60 °C op, -40 to +85 °C non-op
EMI/EMC	MIL-STD-461C/F
TID	30 kRad – component level, enclosure not included (ST) Custom kRad – with enhanced bulk and spot shielding (HR)
SEL LET	No destructive latchup, >68 MeV-cm2/mg
SEU/SEFI	<1 Event/Year @ GEO / Self-detecting and correcting through scrubbing ECC, TMR, and WDT



DEEP SPACE FEATURES (DSN CONFIGURATION ONLY)	
COHERENCY	Software selectable turnaround ratio (64 bit accuracy) <2.5E-13 Allen Deviation (@ 60 s)
RANGING	Turnaround channel (>2 MHz of BW) or regenerative PN ranging. Includes command feed-through suppression. Delay variation <40 ns, accuracy 1-10 m.
BEACON TONES	Tone based semaphores (up to 128) to quickly transmit spacecraft state of health
ADDITIONAL FEATURES	Multi-spacecraft per aperture (MSPA), delta-DOR

CONNECTORS		
HOST	VSRAF-04-10-50-03-N	AirBorn verSI right angle female (40 pin)
RF Receive/RF transmit (separate ports)	Huber & Suhner 29474BHC2R-32-41	SMP Male Full Detent



PART NUMBER	DESCRIPTION	FM PRICE (\$USD)
Frontier-S-LEO-ST	LEO Configuration, Standard	\$115,000
Frontier-S-LEO-HR	LEO Configuration, High Reliability	\$150,000
Frontier-S-DSN-ST	Deep Space Configuration, Standard	\$165,000
Frontier-S-DSN-HR	Deep Space Configuration, High Reliability	\$200,000
	AirBorn verSI mating connector with flying leads	\$500