

Satellite Transponder Module

17-21 & 27-31 GHz



Product Datasheet

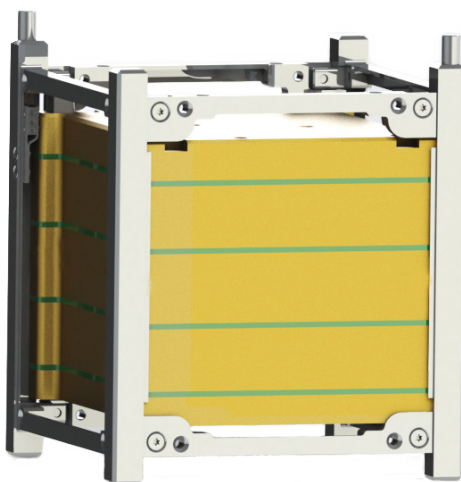
TR500

Integrated Transponder module for Ka-band frequencies.

Overview

TR500 is an integrated Transponder module designed for Low Earth orbit (LEO) Ka-band satellite communication systems. The Transponder consists of two Ka-band Transceivers which operate as wideband up/down converters.

ReliaSat Transponders offers up to 250 MHz of instantaneous bandwidth. The on-board frequency synthesizers, able to lock to an external or on-board 100 MHz reference signal included in the Transceivers. The reference signals are provided by high precision and low power consuming Temperature Compensated Crystal Oscillators (TCXO) with frequency stability of $\pm 0.28\text{ppm}$ between -40°C to 85°C . The Transponder has SMP and SMPM RF connectors, DC Flying Leads for DC power and 6-Pin Pico-Lock connectors for DC power enable, PLL lock, current and temperature sensor connections.



Transponder within a 1U unit.



Features

- TX output frequency 27-31 GHz
- RX input frequency 17-21 GHz
- 27 dBm Saturated output power
- Tx conversion gain 38-43 dB
- Noise figure < 2.5 dB



Applications

- Satellite communications
- High speed data communications
- IOT
- Security
- 5G

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Specification Overview

Transmitter

Parameter	Typical	Unit		
TX Output Frequency Range	17-21	GHz		
TX Saturated Output Power (Pin=-15 dBm)	27	dBm		
TX Output Power at P1dB Compression (Pin=-14 dBm)	26	dBm		
IF Input Frequency Range	1-5	GHz		
IF Input Power	-40 to -15	dBm		
Reference Frequency	10 or 100 (on-board or external)	MHz		
Reference Stability	±0.28 (-40 °C to +85 °C)	PPM		
Conversion Gain	38-43	dB		
Gain Flatness Across Full 1 - 5 GHz Band	±2.5	dB		
Gain Flatness Over 250 MHz Channel bandwidth from SDR	±1	dB		
Typical Phase Noise	10 MHz	100 MHz	dBc/Hz	
	1 kHz	-80	-94	dBc/Hz
	10 kHz	-81	-95	dBc/Hz
	100 kHz	-104	-110	dBc/Hz
	1 MHz	-124	-120	dBc/Hz
Spurious (in band 1-5 GHz)	-50		dBc	
Supply Voltage Range	7-42	Vdc		
DC Power @ 12 VDC	<11.5	W		
DC Current @ 12 VDC	1	A		

Receiver

Parameter	Typical	Unit		
Rx Input Frequency Range	27-30	GHz		
RX Input Power Range	-120 to -30	dBm		
IF Output Frequency Range	1-4	GHz		
IF Output Power Range	-90 to 0	dBm		
Reference Frequency	10 or 100 (on-board or external)	MHz		
Reference Stability	±0.28 (-40 °C to +85 °C)	PPM		
Conversion Gain	30-35	dB		
Gain Flatness Across Full 1-4 GHz Band	±2.5	dB		
Gain Flatness Over Typical Channel Bandwidth from SDR	±1	dB		
Typical Phase Noise	10 MHz	100 MHz	dBc/Hz	
	1 kHz	-83	-89	dBc/Hz
	10 kHz	-86	-90	dBc/Hz
	100 kHz	-108	-95	dBc/Hz
	1 MHz	-122	-119	dBc/Hz
Spurious (in band 1-4 GHz)	-60		dBc	
Image Rejection	62	dB		
Noise Figure	<2.5	dB		
Supply Voltage Range	7-42	Vdc		
DC Power @ 12 VDC	<6	W		
DC Current @ 12 VDC	0.5	A		

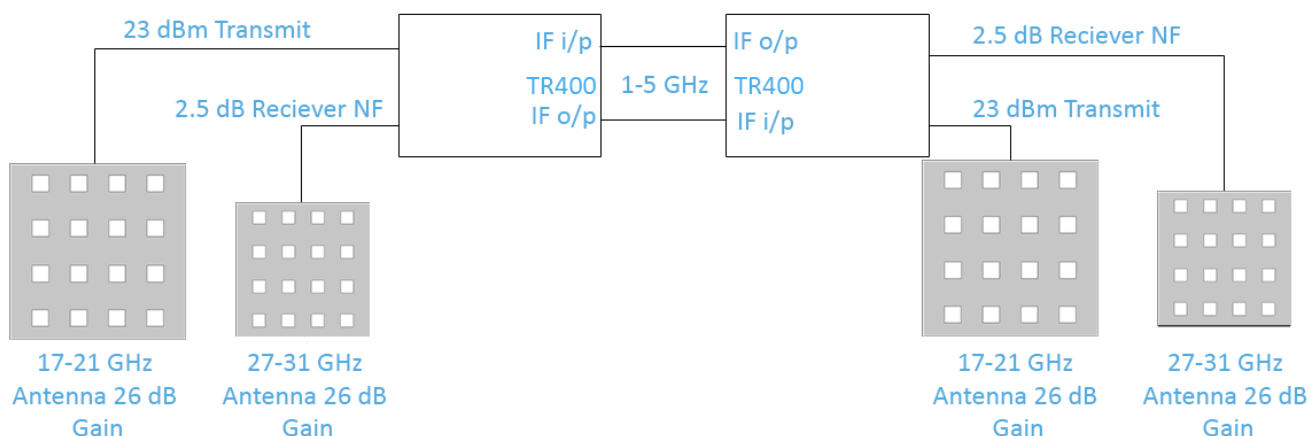
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Block Diagram System



Mechanical and Environmental

Mechanical

Parameter	Typical	Unit
Total Mass	<2	kg
Form Factor Requirement	Cube Sat <1 U	
Enclosure Material Requirement	>2.4 mm thick aluminium	mm
Enclosure Planting Requirement	Nickel (Gold option)	
RF Connector Types	SMPM edge mount	
DC Connector Types	DC flying leads	
IF Signal Connector Types	SMP edge mounts	
Current Sensor, Temperature Sensor, Frequency Synthesiser Lock & DC Power Enable Connections	6-pin Pico-Lock Connector	

Environmental

Parameter	Typical
Operating Temperature Range	-40 °C to +85 °C
Operating Environment	Space
Radiation Tolerance (kRad)	50 Krad
Vibration Requirement	Sine 20g @ 25 KHz, random
Vacuum Requirement	Thermal
Other	ESD, EMC

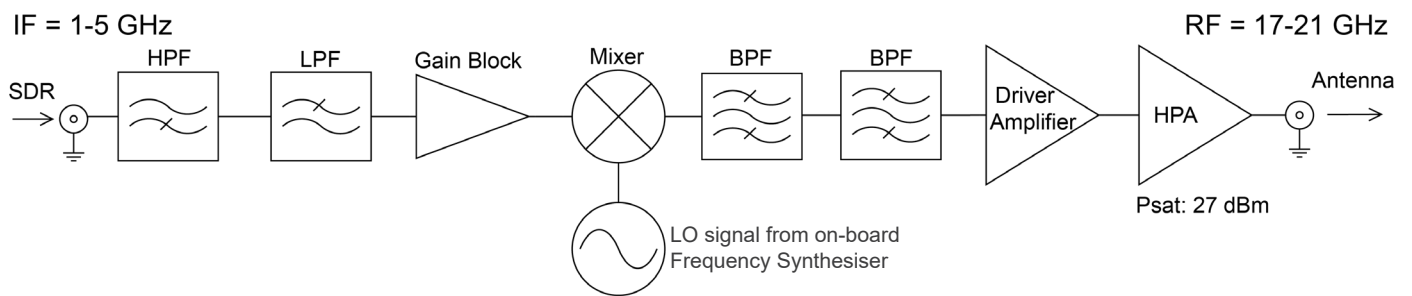
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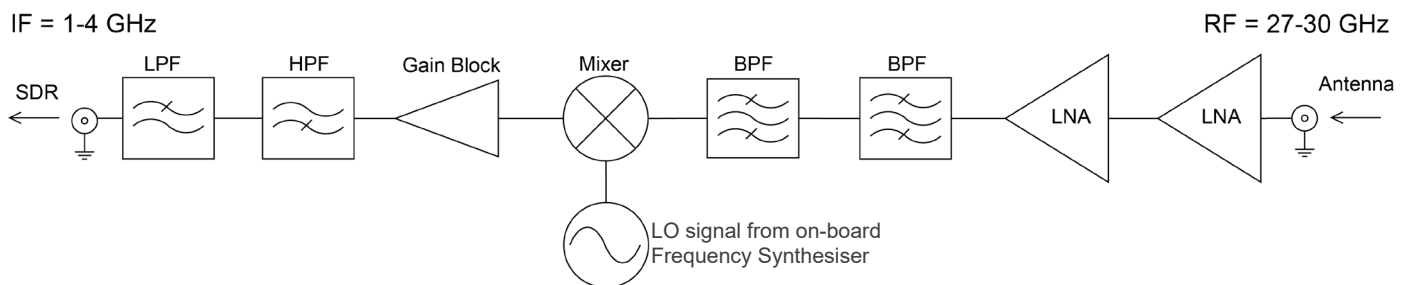
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Simplified Schematic Diagram for Transceivers Within Transponder

Upconverter K-band 17-21



Downconverter Ka-band 27-30



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Specifications For ReliaSat Flat Panel Antennas

ReliaSat's K and Ka-band space grade Flat Panel Antennas have been designed to be used with any Ka-band satellite system, offering a simple, cost effective and high performance solution.

K-band Flat Panel Antenna Specification

Parameter	Value	Unit
Frequency Range	17-21	GHz
VSWR	<1.65	GHz
Peak Gain	>20	dB
Half-Power Beamwidth (HPBW)	9 - 11	Degrees
Polarization	LHCP or RHCP	Preconfigurable
Axial Ratio	<3	dB
Power Handling	5	W
Connector	K (rear mounted)	
Mass	<50	grams
Dimension (Excl. Connector)	84 x 98	mm

Ka-band Flat Panel Antenna Specification

Parameter	Value	Unit
Frequency Range	27-31	GHz
Centre Frequency	29.25	GHz
3 dB Axial Ration Bandwidth	1.5	GHz
Polarization	LHCP or RHCP	
Gain	20	dBi
3 dB Beamwidth	13	Degree
Connector	K (rear mounted)	
Impedance	50	Ohm
Dimension	51 x 51	mm

Contact Information

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