Optiva OTS-2 40 GHz Amplified Microwave Band Fiber Optic Links

ORTEL®
A Photonics Foundries Enterprise

DATASHEET | JANUARY 2024 MICROWAVE

Applications

- Microwave Antenna Signal Distribution
- Electronic Warfare (EW) Systems
- Broadband Delay Line and Signal Processing Systems
- Frequency Distribution Systems
- Radar System Calibration
- Phased Array Antenna Systems, Interferometric Antenna Arrays

Features

- 2 GHz – 40 GHz – Eliminates the performance and cost penalty of block up/down conversion
- Low RIN Source Laser – Provides high-dynamic-range of > 105 dB-Hz2/3 sub-octave
- Microprocessor-Based Transmitter Control for Laser Bias, Modulator Bias & Link Gain – Provides consistent high performance operation and allows for modulator low-bias operation and high SFDR
- Compatible with Ortel's Modular Optiva Platform – Allows multiple format and frequency transport in a single chassis
- DWDM Operation
  - Increases transport capactiy without increasing fiber count

50 MHz to 40 GHz Amplified Microwave Transport System

The Optiva OTS-2 40 GHz Microwave Band transmitter and receiver are ideal to construct transparent fiber optic links in the 50 MHz to 40 GHz frequency range for antenna remoting, electronic warfare systems, broadband delay lines, signal processing systems and other high dynamic-range applications.

GENUINE ORTEL TECHNOLOGY

Optiva microwave band transmitters and receivers are SNMP compliant. They can be housed in the same chassis and monitored by the same Network Management System (NMS) as other Optiva cards to support transport of multiple signal formats and frequency bands in a single flexible platform.

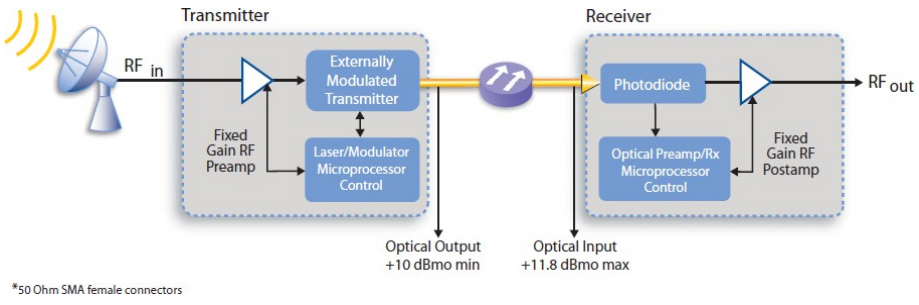
System Design

The Optiva platform includes a wide range fiber optic transport products for satellite and microwave communications from 1 MHz to 40 GHz. These units can be used to construct transparent inter- and intra-facility links for short- and long-haul RF and microwave signal transport, antenna remoting, electronic warfare systems and other high-dynamic-range applications.

optiva PLATFORM

Optiva is a completely modular, hot-swappable platform. Both 19" rack-mount and compact tabletop, or wall-mountable enclosures are available. The 3 RU 19" rack- mount, fan-cooled enclosures Model OT-CC-16F can support up to 16 insert cards and utilize two dual-redundant, hot-swappable 200 watt power supplies. The 1 RU 19" rack-mount, fan-cooled enclosure Model: OT-CC-6-1U can accommodate 6 insert cards and utilizes two hot-swappable 60 watt power supplies. Compact two-slot OT-DTCR-2 enclosures are also available that use an external wall-mount power supply.

Block Diagram



*50 Ohm SMA female connectors

Optiva OTS-2 40 GHz Amplified Microwave Band Fiber Optic Links

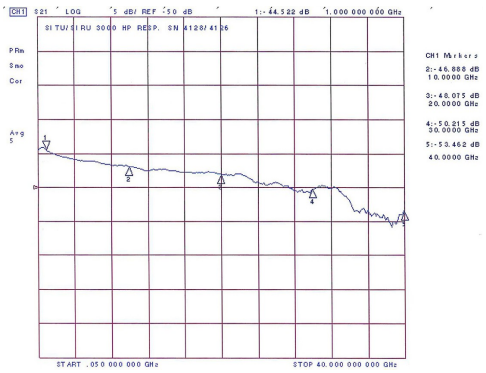
ORTEL®
A Photonics Foundries Enterprise

DATASHEET | JANUARY 2024 MICROWAVE

Performance Highlights

Parameter		Min	Typical	Max	Units
Frequency Range		2	--	40	GHz
RF Input Power	Tx RF amp gain 15 dB 35 dB	 -- --	 -- --	 5 -10	dBm
Wavelength		--	1550	-	nm
Optical Output Power		9	--	11	dBm
Operating Temperature Range		-10	--	50	°C

40 GHz Wideband S21 Frequency Response

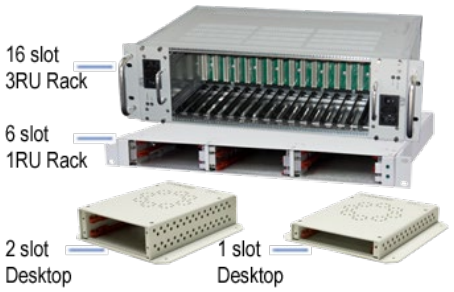


Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of the datasheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

Parameter		Symbol	Min	Max	Units
Operating Temperature		T_{OP}	-20	60	°C
Storage Temperature		T_{STG}	-40	85	°C
RF Input Power	Tx RF amp gain 15 dB 35 dB	S_{in}	 -- --	 10 -5	dBm

Enclosure Options



Optiva OTS-2 40 GHz Amplified Microwave Band Fiber Optic Links

ORTEL®
A Photonics Foundries Enterprise

DATASHEET | JANUARY 2024 MICROWAVE

Transmitter & Receiver Optical Characteristics

Parameter	Symbol	Condition	Min	Typical	Max	Units
Wavelength	λ	--	1530	1550	1562	nm
Optical Output Power	PL	--	9	10	11	dBm
Connector Return Loss	--	--	40	--	--	dB
Optical Connector Type	--	SC/APC	--	--	--	dBm
Receiver Optical Input Power	Pin	--	--	--	+10	dBm
Receiver Responsivity	--	--	0.5	--	--	A/W

Note: In order to prevent reflection-induced distortion degradation, the laser should be connected to an optical cable having a return loss of at least 55 dB for discrete reflections and 30 dB for distributed reflections.

Transmitter & Receiver RF Characteristics

Parameter	Symbol	Condition	Min	Typical	Max	Units
Operational Bandwidth*	--	--	2	--	40	GHz
RF Input Impedance	--	--	--	50	--	
RF Return Loss	--	--	--	--	-6	dB
Amplitude Flatness - Tx	S_{Out} - S_{In}	2 GHz - 40 GHz	--	--	18.0	dB p-p
		Any 500 MHz	--	--	5.5	
Amplitude Flatness - Rx	P_R - S_{Out}	Any 500 MHz	--	--	4.0	dB p-p
		2 GHz -40 GHz	--	--	12.0	
2nd Harmonic Suppression	--	RF Input 0 dBm	--	-70	-50	dBc
1 dB Compression Point (@ 40 GHz)	--	Tx RF amp gain				dBm
		15 dB	-5	--	--	
		35 dB	-20	--	--	
RF Connector	--	2.92 mm (K) Female				

*RF response below 50 MHz and above the maximum stated RF frequency is provided with degraded performance and not guaranteed.
**Test point performance beyond stated frequency range is provided; only the test point reference value tolerance may increase beyond the stated +/- 1 dB

DC Power Consumption - Max

Module Type	Input Voltage (VDC)	Max Current (@+70 °C)
Transmitter	+12	750 mA
Receiver	+12	750 mA

Environmental Specifications

Parameter	Symbol	Min	Max	Units
Operating Temperature	T_{OP}	-10	50	°C
Operating Humidity, Maximum Non-Condensing	--	--	95%	
Operating Altitude, Above Sea Level	--	--	6000	ft
	--	--	1828.8	m
Storage Temperature	T_{STG}	-40	70	°C
Storage Humidity, Maximum Non-Condensing	--	--	95%	--
Storage Altitude, Above Sea Level	--	--	50,000	ft
			15,240	m

Optiva OTS-2 40 GHz Amplified Microwave Band Fiber Optic Links

ORTEL®
A Photonics Foundries Enterprise

DATASHEET | JANUARY 2024 MICROWAVE

Link Performance - 40 GHz Wideband

Parameter	Symbol	Condition	Min	Typical	Max	Units
RF Bandwidth	--	--	2	--	40	GHz
Link Gain (@ 40 GHz, +10 dBmo Rx optical input)*^	G	Tx RF amp gain, Rx RF amp gain 15 15 35 3	 -5 +25	 -- --	 -- --	dB
Link Gain (@ 40 GHz, +0 dBmo Rx optical input) *^	G	Tx RF amp gain, Rx RF amp gain 15 15 35 35	 -25 +10	 -- --	 -- --	dB
Noise Figure (@ 40 GHz)^	NF	Tx RF amp gain, Rx RF amp gain 15 15 30 30	 -- --	 -- --	 32 25	dB
Input IP3(@40 GHz)^^	IIP3	Tx RF amp gain, Rx RF amp gain 15 15 30 30	 0 -15	 -- --	 -- --	dBm
Spurious Free Dynamic Range ^ (@ 40 GHz)^	SFDR	@ 18 GHz	98	100	--	dB-Hz$^{2/3}$
Gain Variation	-- --	2 GHz - 40 GHz Any 500 MHz	-- --	-- --	23.0 5.5	dB, p-p

*Link Gain output will change 2 dB for every 1 dB of optical attenuation.

^Performance based on OTS-2T/K5 RF amplified, without EDFA, OTS-2R/K5 RF amplified

Optiva OTS-2 40 GHz Amplified Microwave Band Fiber Optic Links

ORTEL®
A Photonics Foundries Enterprise

Ordering Information: Transmitter

Transmitter
OTS-2T / K5-2.040-WW-10-XX-1-YY-Z

When ordering replace "*WW*" with one of the ITU Channel Options
When ordering replace "*XX*" with one of the Optical Connector Options
When ordering replace "*YY*" with one of the Fixed Gain RF Amplifier Options
When ordering replace "*Z*" with one of the Enclosure Options

ITU Channel Options (THz / nm) "WW"	Optical Connector Options "XX"	Fixed Gain RF Amplifier Options "YY"	Enclosure Options "Z"
Standard: 00 = non-ITU: 1520-1580 nm Optional: 22 = 192.2 THz/1559.79 nm 23 = 192.3 THz/1558.98 nm 24 = 192.4 THz/1558.17 nm 25 = 192.5 THz/1557.36 nm 26 = 192.6 THz/1556.56 nm 27 = 192.7 THz/1555.75 nm 28 = 192.8 THz/1554.94 nm 29 = 192.9 THz/1554.13 nm 30 = 193 THz/1553.33 nm 31 = 193.1 THz/1552.52 nm 32 = 193.2 THz/1551.72 nm 33 = 193.3 THz/1550.92 nm 34 = 193.4 THz/1550.12 nm 35 = 193.5 THz/1549.32 nm 36 = 193.6 THz/1548.51 nm 37 = 193.7 THz/1547.72 nm	SA = SC / APC FA = FC / APC EA = E2000 / APC	Standard: 15 = 15 dB 35 = 35 dB Contact Factory for custom gain options	1 = Optiva Indoor Rack-Mount Installation 2 = Optiva Outdoor MiniHub Installation

Ordering Information: Receiver

Receiver
OTS-2R / K5-2.040-10-XX-00-1-1-YY-Z

When ordering replace "*XX*" with one of the Optical Connector Options
When ordering replace "YY" with one of the Fixed Gain RF Amplifier Options
When ordering replace "*Z*" with one of the Enclosure Options

Optical Connector Options "XX"	Fixed Gain RF Amplifier Option "YY"	Enclosure Options "Z"
SA = SC / APC FA = FC / APC EA = E2000 / APC	Standard: 15 = 15 dB 35 = 35 dB Contact Factory for custom gain options	1 = Optiva Indoor Rack-Mount Installation 2 = Optiva Outdoor MiniHub Installation

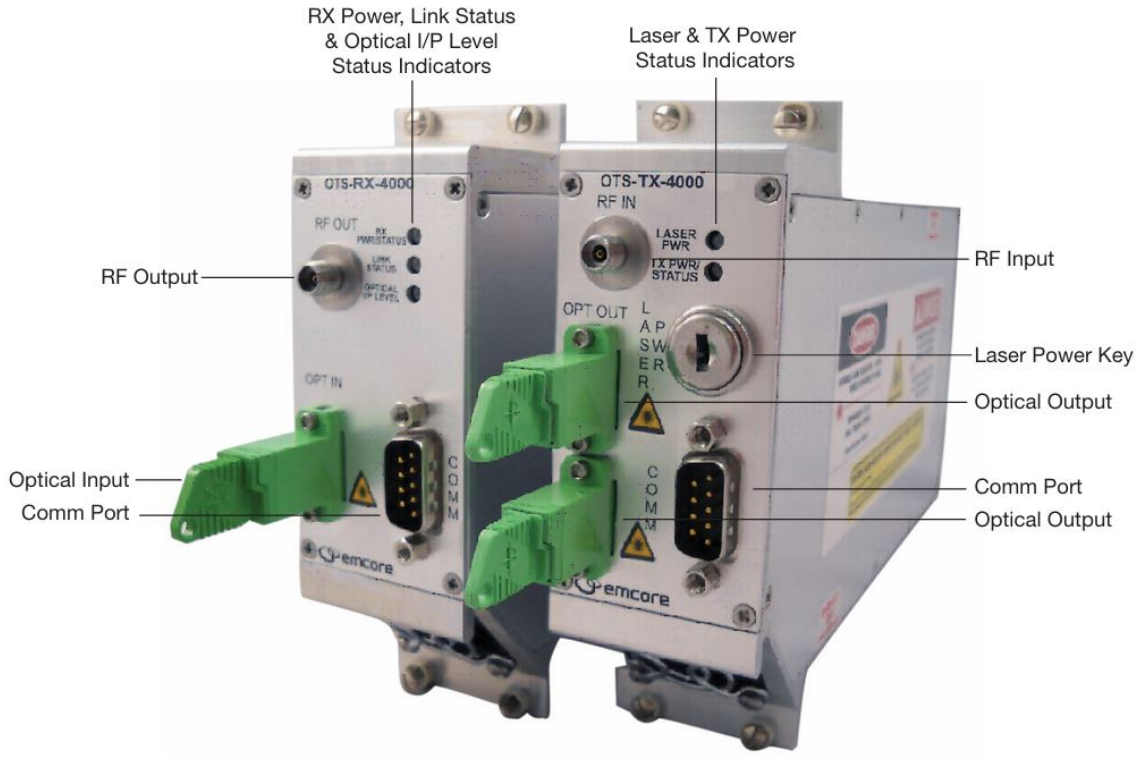
Optiva OTS-2 40 GHz Amplified Microwave Band Fiber Optic Links

ORTEL®
A Photonics Foundries Enterprise

DATASHEET | JANUARY 2024 MICROWAVE

Mechanical Configuration

Each Transmitter and Receiver module occupies two slots in the Ortel Optiva Chassis.



Laser Safety

This product meets the appropriate standard in Title 21 of the Code of Federal Regulations (CFR). FDA/CDRH Class 1M laser product. All versions of this laser are Class 1M laser product, tested according to IEC 60825-1:2007 / EN 60825-1:2007. An additional warning for Class 1M laser products. For diverging beams, this warning shall state that viewing the laser output with certain optical instruments (for example: eye loupes, magnifiers, and microscopes) within a distance of 100 mm may pose an eye hazard. For collimated beams, this warning shall state that viewing the laser output with certain instruments designed for use at a distance (for example: telescopes and binoculars) may pose an eye hazard.

Wavelength = 1.3/1.5 µm.

Maximum power = 30 mW.

*Caution - Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

*IEC is a registered trademark of the International Electrotechnical Commision.

FCC PART 15 COMPLIANT CE MADE IN USA