

SITU3013/3113 .01-13 GHz Externally-Modulated Unamplified Transmitter

emcore®

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MICROWAVE



Applications

- Microwave Antenna Signal Distribution
- Broadband Delay Line and Signal Processing Systems
- Frequency Distribution Systems
- Radar System Calibration
- Phased Array Antenna Systems
- Interferometric Antenna Arrays

Features

- 10 MHz - 13 GHz Frequency Range
- 7 dBm or 10 dBm Optical Output
- ITU Channels 18 - 62
- High-Dynamic-Range
- Fully Integrated Unit
- Bias Control Circuits for Laser and Modulator

The EMCORE SITU3013/3113 (Small Integrated Transmitter Unit) is a high-performance externally-modulated transmitter for applications from 10 MHz to 13 GHz. The SITU family is a fully-integrated unit that contains both the optics and the control electronics. Only DC input voltages and the RF signal are required for operation.

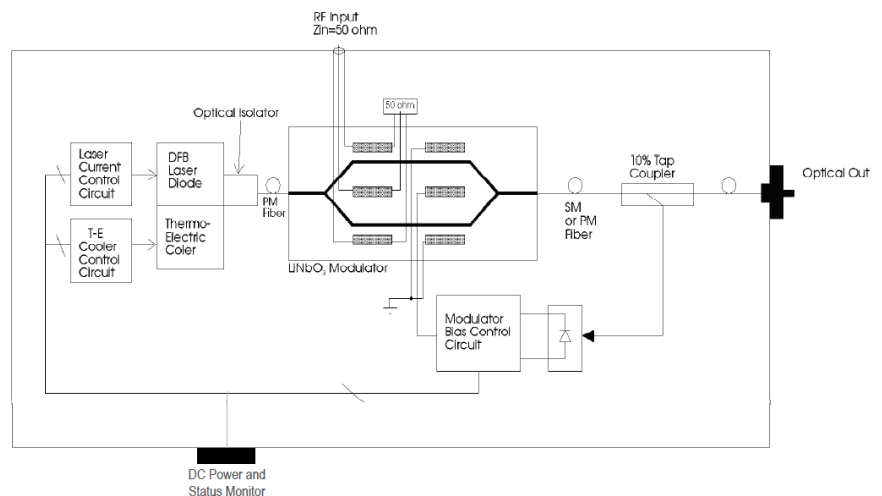
The broad bandwidth of the unit makes it ideal to construct transparent links for microwave antenna signal distribution, Electronic Warfare (EW) systems and satcom systems. Other applications include delay lines, signal processing, radar system calibration, phased array antennas and other systems where it is necessary to transport RF and microwave signals over long distances without signal degradation.

The system operates at a nominal optical wavelength of 1550 nm. Wavelength selected lasers on the ITU grid are also available for WDM applications.

Performance Highlights

Parameter	Min	Typical	Max	Units
Frequency Range	.01	-	13	GHz
RF Input Power	0	-	+25	dBm
Wavelength	-	1550	-	nm
Optical Output Power SITU3013 SITU3113	7 10	8 11	9 12	dBm dBm
ITU Channels	18		62	
Temperature Range	-40	-	70	°C

Block Diagram



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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 data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

Parameter	Symbol	Min	Max	Units
Operating Temperature (within specifications)	T_{OP}	0	50	°C
Operating Temperature (with degraded performance)	T_{OP}	-40	70	°C
Storage Temperature	T_{STG}	-40	70	°C
RF Input (damage level threshold)	S_N	NA	25	dBm
Receiver Optical Input Power (damage level threshold)	SIRU3000	NA	+13	dBm

Optical Specifications

Parameter	Symbol	Condition	Min	Typical	Max	Unit
Wavelength	λ	-	1530	1550	1562	nm
Optical Output Power	P_L	SITU3013 Version SITU3113 Version	7 10	- -	9 12	dBm dBm
Transmitter Source Laser RIN	-	-	-	-165	-163	db-Hz
Connector Return Loss	-	-	60	-	-	dB
Optical Connector Type	-	FC/APC, AVIM	-	-	-	-

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 RF Specifications

Parameter	Symbol	Condition	Min	Typical	Max	Unit
Operational Bandwidth		SITU Version	0.01	-	13	GHz
RF Input Impedance		-	-	50	-	Ω
RF Return Loss		-	9	13	-	dB
Transmitter Gain (@ +7 dBm Optical)	TG	@ 10 GHz @ 13 GHz	-22 -22	-18 -18	- -	dB dB
Transmitter Gain (@ +10 dBm Optical)	TG	@ 10 GHz @ 13 GHz	-16 -16	-12 -12	- -	dB dB
2nd Harmonic Suppression	IP2	RF Input 0 dBm	60	70	-	dBc
1 dB Compression Point		@ 10 GHz @ 13 GHz	+13 +13	+15 +15	- -	dBm dBm
RF Connector		SITU3x13 Version SMA	-	50	-	ohm

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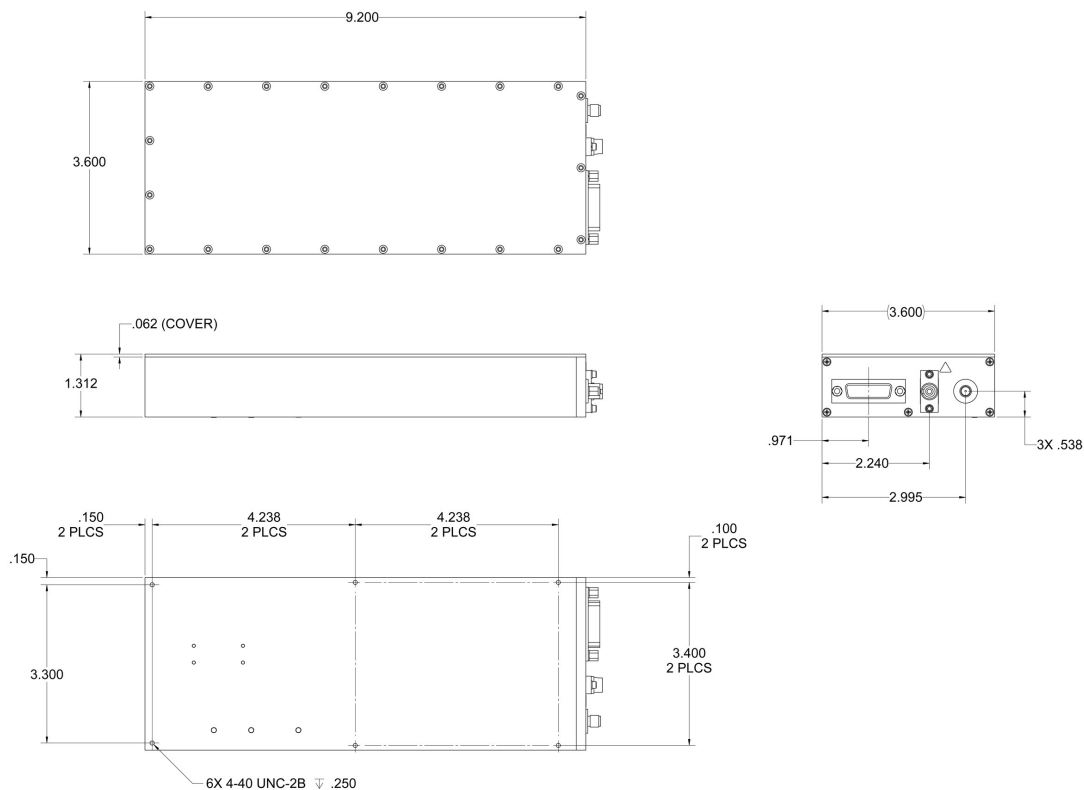
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Broadband Link Performance

SITU3013 transmitter @ quadrature bias with 0 dBm RF input and SIRU3013 receiver with +7 dBm and +10 dBm optical input

Parameter	Symbol	Condition	Min	Typical	Max	Unit
RF Bandwidth	-	-	0.05	-	13	GHz
Link Gain (+7 dBm Rx Optical Input)		@ 10 GHz	-34	-30	-	dB
		@ 13 GHz	-34	-30	-	dB
Link Gain (+10 dBm Rx Optical Input)		@ 10 GHz	-28	-24	-	dB
		@ 13 GHz	-28	-24	-	dB
Noise Figure (+7 dBm RX Optical Input)	NF	@ 10 GHz	40	39	-	dB
		@ 13 GHz	40	39	-	dB
Noise Figure (+10 dBm Rx Optical Input)	NF	@ 10 GHz	37	36	-	dB
		@ 13 GHz	37	36	-	dB
Input IP3	IIP3	@ 10 GHz	-	+23	-	dBm
		@ 13 GHz	-	+23	-	dBm
Spurious Free Dynamic Range	SFDR	@ 7 dBm Rx Optical	105	107	-	dB-Hz ^{2/3}
		@ +10 dBm Rx Optical	108	110	-	dB-Hz ^{2/3}
Gain Variation		1 GHz to 13 GHz	-	5	10	dB

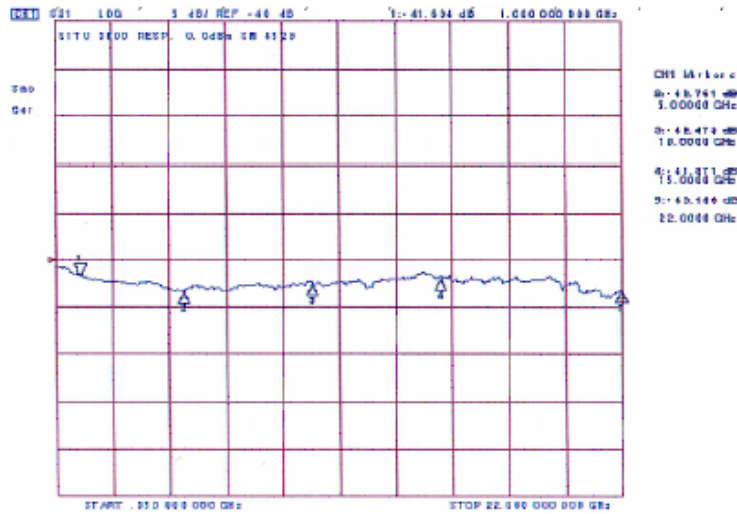
Package Outline



SITU3013/3113 .01-13 GHz Externally-Modulated Unamplified Transmitter

SITU3013/3113 Typical S21 Frequency Response

SITU3013 transmitter with 0 dBm RF input and SIRU3013 receiver with 0 dBm optical output.



D-Connector Pin Out

Pin	Function	Comments
1	+15 VDC	
2	-15 VDC	
3	+5 VDC	
4	-5 VDC	
5	Laser Current Monitor	1 V/A
6	Optical Power Monitor	0.25 V/mW
7	Reserved for Factory Use	
8	Reserved for Factory Use	
9	Tx Power Control	0 V off; 5 V on
10	NC	
11	NC	
12	GND	
13	GND	
14	GND	
15	Reserved for Factory Use	

Physical Parameters

Parameter	Condition	Min	Typical	Max	Unit
Configuration	Self Contained Housing	-	-	-	-
Dimensions	1.3 H x 3.6 W x 9.2 D	-	-	-	in
	33 H x 91.4 W x 233.7 D	-	-	-	mm
Operating/Storage Temperature		-40	-	+70	°C
Weight			29	-	oz
			822.14	-	g

DC Power Consump-

Input Voltage	Max Current
+5	2 A
+15	0.1 A
-5	0.4 A
-15	0.1 A

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Ordering Information: Transmitter

Transmitter
SITU30W3-XX-YY-ZZ

- When ordering replace "W" with one of the Optical Output Power Options
- When ordering replace "XX" with one of the Internal RF Amplifier Gain Options
- When ordering replace "YY" with one of the Optical Connector Options
- When ordering replace "ZZ" with one of the ITU Channel Options

Standard Transmitter Modules:

Product Name	Description
SITU3013-00-FA-00	0.01 - 13 GHz Externally-Modulated , UnAmplified Fiber Optic Transmitter Module, 7 dBm Optical Output, FC/APC
SITU3113-00-FA-00	0.01 - 13 GHz Externally-Modulated , UnAmplified Fiber Optic Transmitter Module, 10 dBm Optical Output, FC/APC

Optical Output Power "W"	Internal RF Amplifier "XX"	Optical Connector Options "YY"	ITU Channel Options (THz / nm) "ZZ"
Standard: 0 = +7 Optical Output	00 = No Amp	Standard: FA = FC / APC	Standard: 00 = non-ITU: 1520-1580 nm
Optional: 1 = +10 Optical Output		Optional: EA = E2000 / APC	Optional: 18 = 191.8 THz/1563.05 nm 19 = 191.9 THz/1562.23 nm 20 = 192 THz/1561.42 nm 21 = 192.1 THz/1560.61 nm 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 38 = 193.8 THz/1546.92 nm 39 = 193.9 THz/1546.12 nm 40 = 194 THz/1545.32 nm 41 = 194.1 THz/1544.53 nm 42 = 194.2 THz/1543.73 nm 43 = 194.3 THz/1542.94 nm 44 = 194.4 THz/1542.14 nm 45 = 194.5 THz/1541.35 nm 46 = 194.6 THz/1540.56 nm 47 = 194.7 THz/1539.77 nm 48 = 194.8 THz/1538.98 nm 49 = 194.9 THz/1538.19 nm 50 = 195 THz/1537.4 nm 51 = 195.1 THz/1536.61 nm 52 = 195.2 THz/1535.82 nm 53 = 195.3 THz/1535.04 nm 54 = 195.4 THz/1534.25 nm 55 = 195.5 THz/1533.46 nm 56 = 195.6 THz/1532.68 nm 57 = 195.7 THz/1531.9 nm 58 = 195.8 THz/1531.12 nm 59 = 195.9 THz/1530.33 nm 60 = 196 THz/1529.55 nm 61 = 196.1 THz/1528.77 nm 62 = 196.2 THz/1527.99 nm

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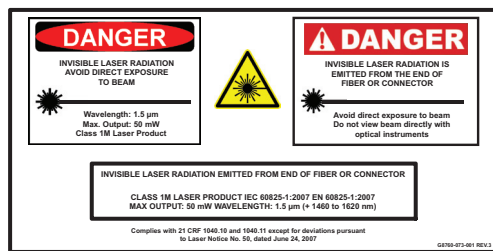
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Laser Safety

This product meets the appropriate standard in Title 21 of the Code of Federal Regulations (CFR). FDA/CDRH Class 1M laser product. This device has been classified with the FDA/CDRH under accession number 0220191. 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 Commission.

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