BOT(N)yyyyZnn

Ultrabroadband Optical Transmitter

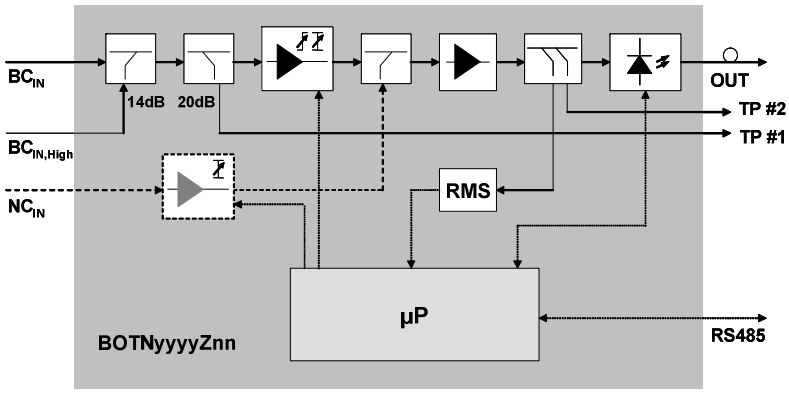
Application

- Electrical to optical conversion of multi-channel CATV signals like AM-VSB, FM and QAM signals
- Downstream or upstream transmission in HFC networks

Features

- Low noise DFB laser with pre-distortion technology, 1310nm, 1550nm, CWDM and DWDM variants with different optical output power
- BOTDWnn: ITU-Grid wavelength with adjustable wavelength: +/- 100 GHz
- Output powers between +3 and +14 dBm (+3 and +6 dBm with un-cooled lasers)
- BOT1550, BOTDWnn: SBS suppression and pre-chirping technology
- Ultra broad bandwidth of up to 5 … 1000 MHz (5 … 450 MHz for transmitters with un-cooled lasers)
- Dual RF inputs: low and high level inputs, optionally narrowcast input with high isolation
- All-electronically adjustments: slope, gain, output power, OMI, pre-chirping etc
- Automatic load control (ALC) for constant OMI_{totrms}
- RS485 control interface
- Very compact, modular BK-type housing
- SC/APC or E2000 connector as standard
- Optionally binary status alarm outputs

Block Diagram



Available Types

S Type	N Type	LType	X Type	Y Type
BOT1310S03 and S06	BOT1310N03, BOT1310N04, … BOT1310N15	BOTDW21L08 and L11, BOTDW22L08 and L11, … BOTDW58L08 and L11	BOT(N)1310X03, X05, X08, X11, X13 and X14	BOT(N)1310Y05, Y08, Y11, Y13 and Y14
BOT1550S03 and S06			BOT(N)1550X08	
BOTCW11S03 … CW18S03, BOTCW11S06 … CW18S06				

General Technical Data

BOT(N)yyyyZnn Mnemonic	
Narrowcast input option N	BOT … no additional narrowcast input NC_{IN} BOTN … equipped with additional narrowcast input NC_{IN}
Wavelength yyyy	1310 and 1550 CWmm – CWDM laser (ITU grid channel number mm) DWmm – DWDM laser (ITU grid channel number mm)
Type Z	S – standard uncooled laser for return path applications L – linear cooled laser for forward path (narrowcast) applications N – standard linear cooled laser for forward path (broadcast) applications X – extremely linear cooled laser for forward path (broadcast) applications Y – super linear cooled laser for forward path (broadcast) applications
Optical output power nn	nn denotes output power in dBm

General Performance Data		S Type	L Type	N Type	X and Y Type
Frequency range		5 ... 450 MHz	5 ... 1000 MHz	45 ... 862 MHz	5 ... 1000 MHz
Impedance		75 Ω			
Input level (OMI = 5%)		73 dBµV minimum for BC_{IN} (87 dBµV minimum for coupled input for $BC_{IN,High}$)			
Gain adjustment		0 … 24 dB			
Slope adjustment		-3 (cable equivalent) … +16 dB (cable equalization)			
RF return loss		> 20 dB (at 47 MHz) - 1.5 dB/oct, min. 15 dB > 18 dB for 5 … 65 MHz			
Input level for input NC_{IN} (OMI = 5%)		80 dBµV minimum for NC_{IN}			
Gain adjustment for narrowcast input NC_{IN}		0 … 12 dB			
Isolation between BC_{IN} and NC_{IN}		> 50 dB			
Testpoint TP1 attenuation		20 dB			
Testpoint TP2 (AC voltage for RF signal and DC voltage for optical output power indication)		80 dBµV+2ΔPopt ± 2.0 dB at OMI = 5% (AC) 0.1 V/mW ± 0.02 V/mW (DC)			
Optical output power adjustment		0 … -3 dB			
Output power tolerance	1310 nm: 1550 nm:	±1.0 dB ±1.0 dB	– ±0.5 dB	±0.7 dB –	±0.5 dB -1.5 … +1.5 dB
Optical wavelength fine tuning		–	-100…+100 GHz	–	–
Optical return loss		> 35 dB	> 45 dB	> 40 dB	> 45 dB
Power consumption (Power consumption in standby mode)		≤ 8 W (≤ 2 W)	≤ 12 W (≤ 4 W)	≤ 12 W (≤ 4 W)	≤ 12 W (≤ 4 W)
Dimensions of BK equipment practice		Module width 1			
Weight		~1.3 kg			

Safety, EMC, Environmental Conditions	
Safety	EN 50 083-1 and EN 60 950 Laser Class 1M acc. IEC 60 825-1 (eyesafe for normal viewing)
EMC	EN 50 083-2
Equipment operation environmental conditions	Class 3.1 acc. ETS 300 019-1-3 (temperature controlled locations)

Transmission Performance Data

X, N, L Type Transmitter Performance

Version ccc, channel allocation plan	C42	B36	N77
Channel allocation plan (number of carriers)	Cenelec (42)	PAL B/G (36)	NTSC (77)
Optical modulation index OMI	4.1%	4.4%	3.0%
Noise bandwidth	5 MHz	5 MHz	4 MHz
CNR Y and X-Type (1310 nm) [1,2] CNR X-Type (1550 nm) [1]	≥ 51.5 dB ≥ 51.0 dB	≥ 52.2 dB ≥ 51.7 dB	≥ 51.2 dB ≥ 50.7 dB
CNR N-Type (1310 nm) [3]	≥ 51.5 dB	≥ 52.2 dB	≥ 51.2 dB
CNR L-Type (1550 nm) [1]	≥ 51.0 dB	≥ 51.7 dB	≥ 50.7 dB
CSO Y-Type (1310 nm) [1,2] CSO X-Type (1310 nm) [1,2] CSO X-Type (1550 nm) [1,4]	≥ 68 dBc ≥ 65 dBc ≥ 60 dBc [5]	≥ 70.5 dBc ≥ 68.5 dBc ≥ 60 dBc	≥ 69 dBc ≥ 67 dBc ≥ 60 dBc
CSO N-Type (1310 nm) [3]	≥ 62 dBc	≥ 65 dBc	≥ 65 dBc
CSO L-Type (1550 nm) [1,4]	≥ 52 dBc [5]	–	–
CTB Y-Type (1310 nm) [1,2] CTB X-Type (1310 nm) [1,2] CTB X-Type (1550 nm) [1,4]	≥ 69 dBc ≥ 66 dBc ≥ 62 dBc	≥ 73 dBc ≥ 70 dBc ≥ 64 dBc	≥ 70 dB ≥ 68 dB ≥ 63 dB
CTB N-Type (1310 nm) [3]	≥ 66 dBc	≥ 70 dBc	≥ 68 dBc
CTB L-Type (1550 nm) [1,4]	≥ 58 dBc	–	–
CXM Y and X-Type (1310 nm) [1,2] CXM X-Type (1550 nm) [1,4]	≥ 63 dBc ≥ 57 dBc [5]	≥ 63 dBc ≥ 57 dBc	≥ 63 dBc ≥ 57 dBc
CXM N-Type (1310 nm) [3]	≥ 62 dBc	≥ 62 dBc	≥ 62 dBc

S Type Transmitter Performance

Laser RIN	≤ -145 dB/Hz (typical better -150 dB/Hz)
IM2 S-Type [7]	≥ 46 dBc (two tone with OMI= 20% per carrier)
IM3 S-Type [7]	≥ 54 dBc (two tone with OMI= 20% per carrier)

Test Conditions

[1] Transmitters with 8 to 15 dBm optical output power: 20 km non-dispersion shifted fiber, optical attenuator and optical receiver with $P_{opt,in}$= 0 dBm, I_{eq}= 7.0 pA/√Hz and η= 0.80 / 0.95 A/W (at 1310 / 1550 nm) used

[2] Transmitters with 3 to 5 dBm optical output power: 6 km non-dispersion shifted fiber, optical attenuator and optical receiver with $P_{opt,in}$= 0 dBm, I_{eq}= 7.0 pA/√Hz and η= 0.80 / 0.95 A/W (at 1310 / 1550 nm) used

[3] No fiber, but optical attenuator and optical receiver with $P_{opt,in}$= 0 dBm, I_{eq}= 7.0 pA/√Hz and η= 0.80 / 0.95 A/W (at 1310 / 1550 nm) used

[4] 0-20 km non-dispersion shifted fiber, optical attenuator and optical receiver with $P_{opt,in}$= 0 dBm, I_{eq}= 7.0 pA/√Hz and η=0.95 A/W used and fiber length (chirp) compensation adjustment set to optimum

[5] Only for measured frequencies up to 600 MHz, otherwise CSO value is 6 dB and CXM value is 2 dB lower!

[6] CXM measured according "C" method: CXM is the ratio between measurement carrier (lowest frequency carrier) and the side lobes arising when all other carriers (besides the meas. carrier) are 100% modulated with 15.625 kHz modulation frequency

[7] No fiber, optical receiver with $P_{opt,in}$= 0 dBm, I_{eq}= 7.0 pA/√Hz and η= 0.95 A/W (at 1550 nm) used