

OTC212Nx-FA

DUAL OPTICAL DWDM FORWARD/RETURN TRANSMITTER FOR DOCSIS 3.1

Application

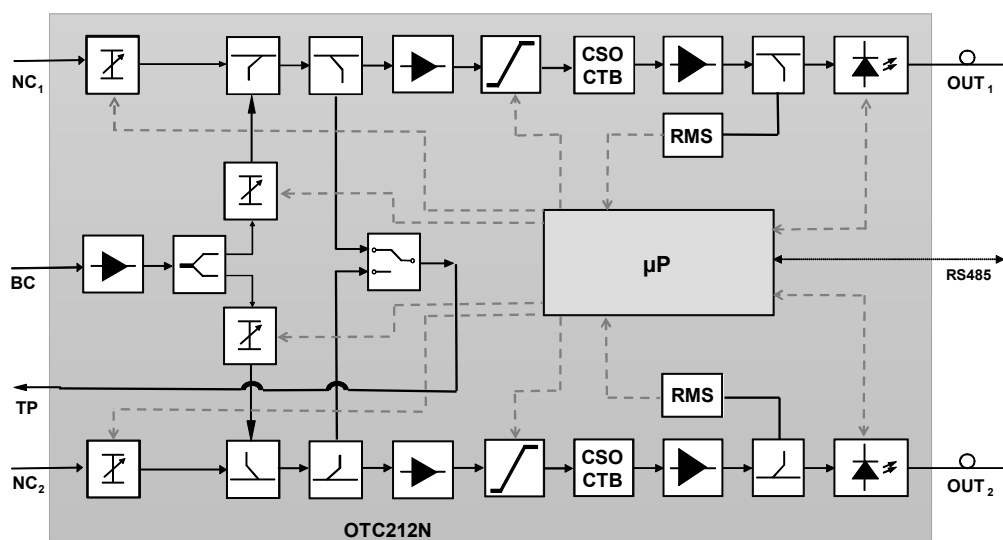
- ▶ Electrical to optical conversion of multi-channel CATV signals (AM-VSB, FM, OFDM and QAM)
- ▶ Downstream DWDM transmission (1310nm, C-band and O-band) in HFC networks
- ▶ Broadcast/Narrowcast split band transmission
- ▶ Upstream DWDM transmission (1310nm, C-band)
- ▶ DOCSIS 3.1 compliant

Features

- ▶ Dual optical forward/return transmitter with two individual Narrowcast inputs, one common Broadcast input and one testpoint
- ▶ Low noise DFB laser with pre-distortion technology
- ▶ Multiple wavelength options:
 - 1310nm \pm 20 nm
 - C-band DWDM, adjustable ITU grid channel
 - O-band DWDM wavelengths
- ▶ Integrated and electronically tuneable fiber dispersion compensation optimizing long haul performance
- ▶ High quality transmission from 0 to 20 km
- ▶ C-band: SBS suppression up to 20 dBm
- ▶ Ultra-broad bandwidth of up to 1218 MHz
- ▶ High decoupling of RF inputs
- ▶ All-electronically adjustments: slope, gain, output power, OMI, pre-chirping etc.
- ▶ Automatic load control (ALC) for constant $OMI_{tot,rms}$
- ▶ RS485 control interface
- ▶ Very compact, modular 2G6-FA type housing
- ▶ SC/APC or E2000 optical connectors



Block Diagram



General Technical Data

OTC212Nyyyyzzz/yyyyzzz Mnemonic

Wavelength yyyy	1310	Wavelength 1310nm \pm 20nm
	1550	Wavelength 1550nm \pm 10nm
	DWmm	C-band DWDM with ITU grid channel number mm wavelength
	OB01	O-band DWDM wavelength of 1330.46nm
	OB02	O-band DWDM wavelength of 1329.22nm
	OB03	O-band DWDM wavelength of 1327.25nm
	OB04	O-band DWDM wavelength of 1325.78nm

Output power and performance zzz	X06	High performance 6 dBm analogue forward transmitter
	X09	High performance 9 dBm analogue forward transmitter
	X10	High performance 10 dBm analogue forward transmitter
	X11	High performance 11 dBm analogue forward transmitter
	X12	High performance 12 dBm analogue forward transmitter
	X13	High performance 13 dBm analogue forward transmitter
	X14	High performance 14 dBm analogue forward transmitter

General Performance Data

Frequency range	5 ... 1218 MHz
Frequency response flatness	
5 ... 12 MHz	\pm 1.5 dB
12 ... 1006 MHz	\pm 0.75 dB
1006 ... 1218 MHz	\pm 1.0 dB
Impedance	75 Ω
Min. BC input level (OMI = 5%)	75 dB μ V
BC Gain adjustment	-3 ... +5 dB
Slope adjustment	0 ... +10 dB (cable equalization)
Min. NC Input level (OMI = 5%)	80 dB μ V
NC Gain adjustment	-17 ... +0 dB
Isolation between BC _{IN} and NC _{IN}	> 50 dB
RF return loss	
5 ... 80 MHz	> 16 dB
80 ... 1218 MHz	> 18 dB (@ 80MHz) – 1 dB/okt, min. 15 dB
Decoupling between transmitter parts	
5 ... 1006 MHz	\geq 60 dB
1006 ... 1218 MHz	\geq 55 dB
Min. Testpoint level (OMI = 5%)	50 dB μ V
Output power tolerance	(see section "Available Types" for availability))
X06, X09, X11, X12, X13 and X14 versions	-0.5 ... +0.5 dB
X10 version	-1.0 ... +1.0 dB
Optical wavelength adjustment range	-100 ... +100 GHz (C- and O-band)
Optical return loss	> 40 dB
Laser relative intensity noise (RIN)	< -155 dB/Hz
Optical output connector (front panel)	SC/APC, E2000
RF connectors (front panel)	F-female
Power consumption	\leq 11 W
Dimensions	Module width 1 slot for 2G6-FA mechanics
Weight	\sim 1.5 kg

Transmitter Digital Forward Application OTC212N...	1550X10 DWmmX10	1310X09, OBnnX09, 1310X11, OBnnX11
No. of QAM carriers (8 MHz bandwidth)	120	120
Optical modulation index OMI	2.4%	2.4%
Noise bandwidth	6.9 MHz	6.9 MHz
CINR for 0 – 20 km optical fiber	43 dB ^{1,2)} 42 dB ^{1,3)}	43.5 dB ⁵⁾
CINR for 0 – 25 km optical fiber	41 dB ^{1,4)}	
CINR for 0 – 30 km optical fiber		42 dB ⁵⁾
BER	< 10 ⁻⁹	< 10 ⁻⁹

¹⁾ Non-dispersion shifted fiber, opt. receiver with $P_{opt,in} = 0$ dBm, $I_{eq} = 7.0$ pA/√Hz and $\eta = 0.95$ A/W (at 1550 nm) used

²⁾ Fiber length (chirp) compensation adjustment set to actually connected fiber length

³⁾ Fiber length (chirp) compensation set to 12km fixed

⁴⁾ Fiber length (chirp) compensation set to 16km fixed

⁵⁾ Non-dispersion shifted fiber, opt. receiver with $P_{opt,in} = 0$ dBm, $I_{eq} = 7.0$ pA/√Hz and $\eta = 0.85$ A/W (at 1310 nm) used

Transmitter Analogue Forward Application OTC212N...	1550X10 DWmmX10	1310X09, OBnnX09, 1310X11, OBnnX11
No. of CW carriers (C42 channel allocation)	42	42
Optical modulation index OMI	4.1%	4.1%
Noise bandwidth	5 MHz	5 MHz
CNR for 0 – 20 km optical fiber	≥ 51 dB ¹⁾	≥ 51.5 dB ²⁾
CSO for 0 – 20 km optical fiber	≥ 60 dBc ^{1,3)}	≥ 63 dBc ²⁾
CTB for 0 – 20 km optical fiber	≥ 62 dBc ^{1,3)}	≥ 64 dBc ²⁾

¹⁾ Non-dispersion shifted fiber, optical attenuator and optical receiver with $P_{opt,in} = 0$ dBm, $I_{eq} = 7.0$ pA/√Hz and $\eta = 0.95$ A/W used

²⁾ Non-dispersion shifted fiber, optical attenuator and optical receiver with $P_{opt,in} = 0$ dBm, $I_{eq} = 7.0$ pA/√Hz and $\eta = 0.85$ A/W used

³⁾ Fiber length (chirp compensation) adjustment set to optimum,

for measured carriers outside 100...600 MHz carrier frequency range, CSO and CTB might be 3 dB lower

Transmitter Return Application OTC212N...	1550X10, DWmmX10	1310X06, X09, X11
Noise-power ratio (dynamic range) for 0 – 40 km		
5 ... 65 MHz noise signal bandwidth	40 dB (12 dB) ¹⁾	40 dB (11 dB) ²⁾
5 ... 204 MHz noise signal bandwidth	40 dB (7 dB) ¹⁾	40 dB (6 dB) ²⁾

¹⁾ Non-dispersion shifted fiber, optical receiver with $P_{opt,in} = -8$ dBm, $I_{eq} = 7.0$ pA/√Hz, $\eta = 0.95$ A/W used

²⁾ Non-dispersion shifted fiber, optical receiver with $P_{opt,in} = -8$ dBm, $I_{eq} = 7.0$ pA/√Hz, $\eta = 0.85$ A/W used

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)

Available Types

OTC212NDWnn/DWnnX10, OTC212N1550/1550X10	nn= 21, 23, 25, 27, 29, 31, 33, 35 and 37 *)
OTC212NOBnn/OBnnX06, X09 and X11	nn= 01, 02, 03, 04
OTC212N1310/1310X06, X09 and X11	

*) Other wavelengths on request!