Opti Max™ 31xx Series Multi-Functional Nodes

OM3100 – 1 GHz 2 x 2 Segmentable Node

9-DN Series 4-Port Housing (Legacy Philips)

42/54 MHz Frequency Split	
42/54 MHz	

55/70 MHz Frequency Split	
55/70 MHz	

65/85 MHz Frequency Split (PAL)	
65/85 MHz	

85/105 MHz Frequency Split	
85/105 MHz	

Receivers (NORs) and Transmitters	
1 GHz NOR Digital Return Processing Module	Analog Return Transmitter

Housing
9-DN Series 4-Port Housing Dimension (Legacy Philips)

Technical Specification

42/54 MHz Split General Node Specifications

Characteristics	Specification
General	
Number of Active RF/AC Ports	4 (3 for 1 x 3 RF module)
Number of AC Only Ports	2 (1 for 1 x 3 RF module)
Housing Passband, MHz	1002
Port Impedance, Ω	75
AC Current Passing, A (All Ports)	15
Operating Temperature Range, °C	–40 to 60
Forward Path Specifications	
Optical Specifications	
Optical Input Wavelength, nm	1290 to 1600
Optical Input Range, dBm[1]	–3 to 3
RF Specifications	
Operating Passband, MHz	54 to 1002
Output Level @ 1006 MHz, –3 dBm input, 3.5% OMI, dBmV, min.	53.5 (Standard Gain NOR), 58 (High Gain NOR)
Level Stability, dB, max.	± 1.5
Gain Slope, dB[2]	9.5, 11.5, 12.5, 14.5, 16.5 ± 1.0
Flatness @ Gain Slope, dB	± 1.5
Return Loss, dB, min. (All RF Ports)	16.0
Port to Port Isolation, dB, typ.	60
Testpoints	
Forward Output, Directional, dB	–20 ± 0.75
Receiver (NOR) Input Optical Level Testpoint	1V/mW ± 10%
79 NTSC Channel Performance[3,4]	
Frequency, MHz	1002/870/550/54
Output Level, dBmV[5]	53.5/51.2/45.7/37 GaAs; 56/53.7/48.2/39.5 GaN
Carrier to Noise Ratio, 4 MHz, 75 Ω, dB	57 (GaAs), 59.5 (GaN), 0 dBm input
Composite Triple Beat, –dBc	73
Composite 2IM, –dBc	67
Cross Modulation, per NCTA std., –dB	70
Composite Intermodulation Noise, dB[6]	62.5 (GaAs), 60 (GaN)
Composite Intermodulation Noise, dB[7]	68.5 (GaAs), 65 (GaN)
30 NTSC Channel GaN Performance	
Frequency, MHz	1002/870/247/54
Analog Output Level, dBmV[8]	56.0/53.7/42.9/39.5 (GaN)
Carrier to Noise Ratio, 4 MHz, 75 Ω, dB	59.5 (GaN), 0 dBm input
Composite Triple Beat, –dBc	80
Composite 2IM, –dBc	75
Composite Intermodulation Noise, dB[9]	56
All Digital Loading GaN Performance[3]	
Channel Loading, # of 256-QAM channels, NTSC[10]	154
Frequency, MHz	1002/870/550/54
Analog Output Level, dBmV[8]	56.0/53.7/48.1/39.5
Digital Output Level, dBmV	50.0/47.7/42.1/33.5
Carrier to Noise Ratio, 4 MHz, 75 Ω, dB	59.5, 0 dBm input
Composite Intermodulation Noise CIN, dB[11]	56
Chrominance to Luminance Delay	
Channel 2, ns max./3.58 MHz	20
Channel 3, ns max./3.58 MHz	10
Channel 4, ns max./3.58 MHz	7
Channel 5, ns max./3.58 MHz	4
Hum Modulation, time domain @ 15 A	
54–1002 MHz, –dBc	60
Gain Control, plug-in PADs[12]	10-Ax-WC (0–26 dB); 9-A0-S to 9-A9-S in 1 dB steps (NOR)
Equalization[12]	
1 GHz	GEQL-1GHZ-000-1 (0 dB), GEQL-1GHZ-020-1 to GEQL-1GHZ-130-1 (2–13 dB)
870 MHz	GEQL-870-020-1 to GEQL-870-130-1 (2–13 dB)

Characteristics	Specification
Return Path Specifications	
RF Specifications	
Operating Passband, MHz	5 to 42
Optimum RF Input Level, dBmV/6 MHz	12
Gain Slope, dB	± 1.0
Flatness @ Gain Slope, dB	± 1.0
RF Stability, dB	± 2.5
Return Loss, dB (All RF Ports)	16.0
Port to Port Isolation, dB, typ.	50
Testpoints	
RF Input, Directional, dB	–20 ± 0.75
Transmitter Output Optical Power	1V/mW ± 10%
Group Delay	
5.5 to 7 MHz, ns, max.	62
38.5 to 40 MHz, ns, max.	20
Hum Modulation (Time Domain @ 15 A)	
5 to 10 MHz, dB	55
11 to 42 MHz, dB	60
Gain Control, plug-in PADs[12]	10-A0-WC to 10-A19-WC (0–19 dB, in 1 dB steps) or Amini-0 to Amini-20 (0 to 20 dB, in 1 dB steps)
OM3100 w/ Isolated 1310 DFB and 1550 DFB Analog TX Specifications	
Transmitted Wavelength, nm	1310 ± 20, 1550 ± 25
Output Power, @ connector output, dBm[13]	3.0 ± 1.0
NPR/Dynamic Range, dB[14]	41/12
Peak NPR, dB, typ.[14]	48
BER Dynamic Range, QPSK/16-QAM/64-QAM, dB[14, 15]	45/35/25
OM3100 w/ Isolated CWDM DFB Analog TX Specifications	
Transmitted Wavelength, nm	1471 to 1611 ± 6.5 nm (8 CWDM channels, 20 nm spacing)
Output Power, @ connector output, dBm[13]	3.0 ± 1.0
NPR/Dynamic Range, dB[14]	35/15
Peak NPR, dB, typ.[14]	45
BER Dynamic Range, QPSK/16-QAM/64-QAM, dB[14,15]	45/35/25

Powering Requirements[16]	DC Curr. (A, max.) @ 24 V	DC Pwr (W)	AC I/P Current @ 60/90 V (A)	AC I/P Pwr (W)
1 x 3/4 x 1 w/ 1310/1550 new DFB NRT	2.175	52.2	1.09/0.806	59.3
1 x 3/4 x 1 w/ 1310 legacy DFB NRT	2.4	57.6	1.21/0.866	65.1
1 x 3/4 x 1 w/ 1310/1550 CWDM DFB NRT	2.55	61.2	1.292/0.905	69.1
1 x 3 Redundant w/ 1310/1550 new DFB NRT	2.725	65.4	1.38/0.956	73.6
1 x 3 Redundant w/ 1310 legacy DFB NRT	3.175	76.2	1.624/1.09	85.6
1 x 3 Redundant w/ 1310/1550 CWDM NRT	3.475	83.4	1.79/1.183	93.6
1 x 4/4 x 1 w/ 1310/1550 new DFB NRT	2.71	65.04	1.28/0.85	76.52
1 x 4/4 x 1 w/ 1310 legacy DFB NRT	2.93	70.32	1.38/0.92	82.73
1 x 4/4 x 1 w/ 1310/1550 CWDM DFB NRT	3.08	73.92	1.45/0.97	86.96
1 x 4/4 x 1 Redundant w/ 1310/1550 new DFB NRT	3.21	77.04	1.51/1.01	90.64
1 x 4/4 x 1 Redundant w/ 1310 legacy DFB NRT	3.66	87.84	1.72/1.15	103.34
1 x 4/4 x 1 Redundant w/ 1310/1550 CWDM NRT	3.96	95.04	1.86/1.24	111.81
2 x 2 w/ 1310/1550 new DFB NRT	3.41	81.84	1.60/1.07	96.28
2 x 2 w/ 1310 legacy DFB NRT	3.86	92.64	1.82/1.21	108.99
2 x 2 w/ 1310/1550 CWDM NRT	4.16	99.84	1.96/1.31	117.46

Specification Document Number 1502422 Rev E, 1504410 Rev B, 1507273 Rev B

NOTES:

1. Circuit resiliency to 5 dBm.
2. Typical slope is 6.5 dB with no EQ installed. Slope is defined as the difference between the highest and lowest specified frequency on a straight line determined by applying a best fit/least squared formula to the measured response.
3. The distortion values listed are for the node only. To obtain a particular link performance, combine the listed node performance values with the applicable transmitter performance values.
4. Analog channels occupying the 54 to 550 MHz frequency range with digitally compressed channels or equivalent broadband noise to 1002 MHz at levels 6dB below equivalent video channels.
5. At the specified operational tilt of 16.5 dB, the maximum output level for 870 MHz or 1002 MHz loading is 56.5 dBmV (GaAs)/59 dBmV (GaN) at the highest frequency.
6. Systems operating with digitally compressed channels or equivalent broadband noise from 550 to 1002 MHz at levels 6 dB below equivalent video channels will experience a composite distortion (CIN) appearing as noise in the 54 to 550 MHz frequency spectrum.
7. Systems operating with digitally compressed channels or equivalent broadband noise from 550 to 870 MHz at levels 6 dB below equivalent video channels will experience a composite distortion (CIN) appearing as noise in the 54 to 550 MHz frequency spectrum.
8. At the specified operational tilt of 16.5 dB, the maximum output level for 870 MHz or 1002 MHz loading is 59 dBmV at the highest frequency.
9. Systems operating with digitally compressed channels or equivalent broadband noise from 250 to 1002 MHz at levels 6 dB below equivalent video channels will experience a composite distortion (CIN) appearing as noise in the 54 to 250 MHz frequency spectrum.
10. Digital channels occupy 54 to 1002 MHz with 3 channels replaced by analog channels for CCNR measurement.
11. Systems operating with digitally compressed channels or equivalent broadband noise from 54 to 1002 MHz at levels 6 dB below equivalent video channels will experience a composite distortion (CIN) appearing as noise relative to any remaining analog channels.
12. ARRIS accessories should be used for guaranteed performance; using third party accessories may result in degraded and/or intermittent performance.
13. Measured at the output of the bulkhead connector.
14. All performance specifications measured over a 6 dB (pure glass) fiber link using 40 MHz noise loading with an optical receiver causing no degradation to performance.
15. Bit Error Rate (BER) performance is measured with QPSK loading over 6 dB pure fiber link for a BER of 10^{-6}. All measurements are typical.
16. DC current draw requirements for Value Max transponder and daughter card: add 55 mA @ 24 V. All values assume the use of a 1 GHz NOR receiver; the use of a legacy NOR will increase the DC current draw by 140 mA each.

55/70 MHz Split General Node Specifications

Characteristics	Specification
General	
Number of Active RF/AC Ports	4
Number of AC Only Ports	1 (Optional)
Housing Passband, MHz	1006
Port Impedance, Ω	75
AC Current Passing, A (All Ports)	15
Operating Temperature Range, °C	–40 to 60
Forward Path Specifications	
Optical Specifications	
Optical Input Wavelength, nm	1290 to 1600
Optical Input Range, dBm[1]	–3 to 3
RF Specifications	
Operating Passband, MHz	70 to 1006
Output Level @ 1006 MHz, –3 dBm input, 3.5% OMI, dBmV, min.	53.5
Level Stability, dB, max.	± 1.5
Gain Slope, dB[2]	9.5, 11.5, 12.5, 14.5, 16.5 ± 1.0
Flatness @ Gain Slope, dB	± 1.5
Return Loss, dB, min. (All RF Ports)	16.0
Port to Port Isolation, dB, typ.	60
Testpoints	
Forward Output, Directional, dB	–20 ± 0.75
Receiver (NOR) Input Optical Level Testpoint	1V/mW ± 10%
76 NTSC Channel Performance[3,4]	
Frequency, MHz	1006/870/550/70
Output Level, dBmV[5]	53.5/51.2/45.5/37
Carrier to Noise Ratio, 4 MHz, 75 Ω, dB	57, 0 dBm input
Composite Triple Beat, –dBc	73
Composite 2IM, –dBc	67
Cross Modulation, per NCTA std., –dB	70
Composite Intermodulation Noise, dB[6]	62.5
Composite Intermodulation Noise, dB[7]	68.5
Chrominance to Luminance Delay	
Channel 5, ns max./3.58 MHz	9
Channel 6, ns max./3.58 MHz	7
Hum Modulation, time domain @ 15 A	
70–1006 MHz, –dBc	60
Gain Control, plug-in PADs[8]	10-Ax-WC (0–26 dB); 9-A0-S to 9-A9-S in 1 dB steps (NOR)
Equalization[8]	
1 GHz	GEQL-1GHZ-000-1 (0 dB), GEQL-1GHZ-020-1 to GEQL-1GHZ-130-1 (2–13 dB)
870 MHz	GEQL-870-020-1 to GEQL-870-130-1 (2–13 dB)

Characteristics	Specification
Return Path Specifications	
RF Specifications	
Operating Passband, MHz	5 to 55
Optimum RF Input Level, dBmV/6 MHz	12
Gain Slope, dB	± 1.0
Flatness @ Gain Slope, dB	± 1.0
RF Stability, dB	± 2.5
Return Loss, dB (All RF Ports)	16.0
Port to Port Isolation, dB, typ.	50
Testpoints	
RF Input, Directional, dB	–20 ± 0.75
Transmitter Output Optical Power	1V/mW ± 10%
Group Delay	
5.5 to 7 MHz, ns, max.	62
53.5 to 55 MHz, ns, max.	15
Hum Modulation (Time Domain @ 15 A)	
5 to 10 MHz, dB	55
11 to 42 MHz, dB	60
Gain Control, plug-in PADs[8]	10-A0-WC to 10-A19-WC (0–19 dB, in 1 dB steps) or Amini-0 to Amini-20 (0 to 20 dB, in 1 dB steps)
OM3100 w/ Isolated 1310 DFB and 1550 DFB Analog TX Specifications	
Transmitted Wavelength, nm	1310 ± 20, 1550 ± 25
Output Power, @ connector output, dBm[9]	3.0 ± 1.0
NPR/Dynamic Range, dB[10]	35/13
Peak NPR, dB, typ.[10]	45
BER Dynamic Range, QPSK/16-QAM, dB[10, 11]	43/33
OM3100 w/ Isolated CWDM DFB Analog TX Specifications	
Transmitted Wavelength, nm	1471 to 1611 ± 6.5 nm (8 CWDM channels, 20 nm spacing)
Output Power, @ connector output, dBm[9]	3.0 ± 1.0
NPR/Dynamic Range, dB[10]	35/13
Peak NPR, dB, typ.[10]	45
BER Dynamic Range, QPSK/16-QAM, dB[10,11]	43/33

Powering Requirements[12]	DC Curr. (A, max.) @ 24 V	DC Pwr (W)	AC I/P Current @ 60/90 V (A)	AC I/P Pwr (W)
1 x 3/4 x 1 w/ 1310/1550 new DFB NRT	2.175	52.2	1.09/0.806	59.3
1 x 3/4 x 1 w/ 1310 legacy DFB NRT	2.4	57.6	1.21/0.866	65.1
1 x 3/4 x 1 w/ 1310/1550 CWDM DFB NRT	2.55	61.2	1.292/0.905	69.1
1 x 3 Redundant w/ 1310/1550 new DFB NRT	2.725	65.4	1.38/0.956	73.6
1 x 3 Redundant w/ 1310 legacy DFB NRT	3.175	76.2	1.624/1.09	85.6
1 x 3 Redundant w/ 1310/1550 CWDM NRT	3.475	83.4	1.79/1.183	93.6
1 x 4/4 x 1 w/ 1310/1550 new DFB NRT	2.71	65.04	1.28/0.85	76.52
1 x 4/4 x 1 w/ 1310 legacy DFB NRT	2.93	70.32	1.38/0.92	82.73
1 x 4/4 x 1 w/ 1310/1550 CWDM DFB NRT	3.08	73.92	1.45/0.97	86.96
1 x 4/4 x 1 Redundant w/ 1310/1550 new DFB NRT	3.21	77.04	1.51/1.01	90.64
1 x 4/4 x 1 Redundant w/ 1310 legacy DFB NRT	3.66	87.84	1.72/1.15	103.34
1 x 4/4 x 1 Redundant w/ 1310/1550 CWDM NRT	3.96	95.04	1.86/1.24	111.81
2 x 2 w/ 1310/1550 new DFB NRT	3.41	81.84	1.60/1.07	96.28
2 x 2 w/ 1310 legacy DFB NRT	3.86	92.64	1.82/1.21	108.99
2 x 2 w/ 1310/1550 CWDM NRT	4.16	99.84	1.96/1.31	117.46

Specification Document Number 1504910 Rev B

NOTES:

1. Circuit resiliency to 5 dBm.
2. Typical slope is 6.5 dB with no EQ installed. Slope is defined as the difference between the highest and lowest specified frequency on a straight line determined by applying a best fit/least squared formula to the measured response.
3. The distortion values listed are for the node only. To obtain a particular link performance, combine the listed node performance values with the applicable transmitter performance values.
4. Analog channels occupying the 70 to 550 MHz frequency range with digitally compressed channels or equivalent broadband noise to 1006 MHz at levels 6dB below equivalent video channels.
5. At the specified operational tilt of 16.5 dB, the maximum output level for 870 MHz or 1006 MHz loading is 56.5 dBmV at the highest frequency.
6. Systems operating with digitally compressed channels or equivalent broadband noise from 550 to 1006 MHz at levels 6 dB below equivalent video channels will experience a composite distortion (CIN) appearing as noise in the 70 to 550 MHz frequency spectrum.
7. Systems operating with digitally compressed channels or equivalent broadband noise from 550 to 870 MHz at levels 6 dB below equivalent video channels will experience a composite distortion (CIN) appearing as noise in the 70 to 550 MHz frequency spectrum.
8. ARRIS accessories should be used for guaranteed performance; using third party accessories may result in degraded and/or intermittent performance.
9. Measured at the output of the bulkhead connector.
10. All performance specifications measured over a 6 dB (pure glass) fiber link using 40 MHz noise loading with an optical receiver causing no degradation to performance.
11. Bit Error Rate (BER) performance is measured with QPSK/16-QAM loading over 6 dB pure fiber link for a BER of 10^{-6}. All measurements are typical.
12. DC current draw requirements for Value Max transponder and daughter card: add 55 mA @ 24 V. All values assume the use of a 1 GHz NOR receiver; the use of a legacy NOR will increase the DC current draw by 140 mA each.

65/85 MHz Split General Node Specifications

Characteristics	Specification
General	
Number of Active RF/AC Ports	4
Number of AC Only Ports	1 (Optional)
Housing Passband, MHz	1006
Port Impedance, Ω	75
AC Current Passing, A (All Ports)	15
Operating Temperature Range, °C	–40 to 60
Forward Path Specifications	
Optical Specifications	
Optical Input Wavelength, nm	1290 to 1600
Optical Input Range, dBm[1]	–3 to 3
RF Specifications	
Operating Passband, MHz	85 to 1006
Output Level @ 1006 MHz, –3 dBm input, 3.5% OMI, dBmV, min.	53.5
Level Stability, dB, max.	± 1.5
Gain Slope, dB[2]	9.5, 11.5, 12.5, 14.5, 16.5± 1.0
Flatness @ Gain Slope, dB	± 1.5
Return Loss, dB, min. (All RF Ports)	16.0
Port to Port Isolation, dB, typ.	60
Testpoints	
Forward Output, Directional, dB	–20 ± 0.75
Receiver (NOR) Input Optical Level	1V/mW ± 10%
60 PAL Channel Performance[3,4]	
Frequency, MHz	1006/600/85
Output Level, dBmV[5]	53.5/46.3/37
Carrier to Noise Ratio, 5 MHz, 75 Ω, dB	57, 0 dBm input
Composite Triple Beat, –dBc	73
Composite 2IM, –dBc	69
Cross Modulation (per NCTA standard), –dB	70
Composite Intermodulation Noise CIN, dB[6]	63
42 Channel CENELEC Performance[7]	
Frequency, MHz	870/85
Output Level, dBmV	53/45
Carrier to Noise Ratio, 5 MHz, 75 Ω, dB	49, 0 dBm input
Composite Triple Beat, –dBc	62
Composite 2IM, –dBc	62
Relative Chroma Delay	
88.58 to 92.16 MHz, ns	5
95.74 to 99.32 MHz, ns	4
102.90 to 106.48 MHz, ns	3
Hum Modulation (Time Domain @ 15 A)	
85 to 1006 MHz, dB	60
Gain Control, plug-in PADs	10-Ax-WC (0–26 dB); 9-A0-S to 9-A9-S in 1 dB steps (NOR)
Equalization[8]	
1 GHz	GEQL-1GHZ-000-1 (0 dB),
870 MHz	GEQL-1GHZ-020-1 to GEQL-1GHZ-130-1 (2–13 dB) GEQL-870-020-1 to GEQL-870-130-1 (2–13 dB)

Characteristics	Specification
Return Path Specifications	
RF Specifications	
Operating Passband, MHz	5 to 65
Optimum RF Input Level, dBmV/6 MHz	12
Gain Slope, dB	± 1.0
Flatness @ Gain Slope, dB	± 1.0
RF Stability, dB	± 2.5
Return Loss, dB (All RF Ports)	16.0
Port to Port Isolation, dB, typ.	50
Testpoints	
RF Input, Directional, dB	–20 ± 0.75
Transmitter Output Optical Power	1V/mW ± 10%
Group Delay	
5.5 to 7 MHz, ns, max.	62
63.5 to 65 MHz, ns, max.	15
Hum Modulation (Time Domain @ 15 A)	
5 to 10 MHz, dB	55
11 to 65 MHz, dB	60
Gain Control, plug-in PADs[8]	10-A0-WC to 10-A19-WC (0–19 dB, in 1 dB steps) or Amini-0 to Amini-20 (0 to 20 dB, in 1 dB steps)
OM3100 w/ Isolated 1310 DFB and 1550 DFB Analog TX Specifications	
Transmitted Wavelength, nm	1310 ± 20, 1550 ± 25
Output Power, @ connector output, dBm[9]	3.0 ± 1.0
NPR/Dynamic Range, dB[10]	39/12
Peak NPR, dB, typ.[10]	47
BER Dynamic Range, QPSK/16-QAM, dB[10, 11]	43/33
OM3100 w/ Isolated CWDM DFB Analog TX Specifications	
Transmitted Wavelength, nm	1471 to 1611 ± 6.5 nm (8 CWDM channels, 20 nm spacing)
Output Power, @ connector output, dBm[9]	3.0 ± 1.0
NPR/Dynamic Range, dB[10]	33/15
Peak NPR, dB, typ.[10]	44
BER Dynamic Range, QPSK/16-QAM, dB[10,11]	43/33

Powering Requirements[12]	DC Curr. (A, max.) @ 24 V	DC Pwr (W)	AC I/P Current @ 60/90 V (A)	AC I/P Pwr (W)
1 x 3/4 x 1 w/ 1310/1550 new DFB NRT	2.175	52.2	1.09/0.806	59.3
1 x 3/4 x 1 w/ 1310 legacy DFB NRT	2.4	57.6	1.21/0.866	65.1
1 x 3/4 x 1 w/ 1310/1550 CWDM DFB NRT	2.55	61.2	1.292/0.905	69.1
1 x 3 Redundant w/ 1310/1550 new DFB NRT	2.725	65.4	1.38/0.956	73.6
1 x 3 Redundant w/ 1310 legacy DFB NRT	3.175	76.2	1.624/1.09	85.6
1 x 3 Redundant w/ 1310/1550 CWDM NRT	3.475	83.4	1.79/1.183	93.6
1 x 4/4 x 1 w/ 1310/1550 new DFB NRT	2.71	65.04	1.28/0.85	76.52
1 x 4/4 x 1 w/ 1310 legacy DFB NRT	2.93	70.32	1.38/0.92	82.73
1 x 4/4 x 1 w/ 1310/1550 CWDM DFB NRT	3.08	73.92	1.45/0.97	86.96
1 x 4/4 x 1 Redundant w/ 1310/1550 new DFB NRT	3.21	77.04	1.51/1.01	90.64
1 x 4/4 x 1 Redundant w/ 1310 legacy DFB NRT	3.66	87.84	1.72/1.15	103.34
1 x 4/4 x 1 Redundant w/ 1310/1550 CWDM NRT	3.96	95.04	1.86/1.24	111.81
2 x 2 w/ 1310/1550 new DFB NRT	3.41	81.84	1.60/1.07	96.28
2 x 2 w/ 1310 legacy DFB NRT	3.86	92.64	1.82/1.21	108.99
2 x 2 w/ 1310/1550 CWDM NRT	4.16	99.84	1.96/1.31	117.46

NOTES:

1. Circuit resiliency to 5 dBm.
2. Typical slope is 6.5 dB with no EQ installed. Slope is defined as the difference between the highest and lowest specified frequency on a straight line determined by applying a best fit/least squared formula to the measured response.
3. The distortion values listed are for the node only. To obtain a particular link performance, combine the listed node performance values with the applicable transmitter performance values.
4. Analog channels occupying the 70 to 550 MHz frequency range with digitally compressed channels or equivalent broadband noise to 1006 MHz at levels 6dB below equivalent video channels.
5. At the specified operational tilt of 16.5 dB, the maximum output level for 870 MHz or 1006 MHz loading is 56.5 dBmV at the highest frequency.
6. Systems operating with digitally compressed channels or equivalent broadband noise from 600 to 1006 MHz at levels 6 dB below equivalent video channels will experience a composite distortion (CIN) appearing as noise in the 85 to 600 MHz frequency spectrum.
7. According to EN50083-3, 42 CENELEC channel loading, with diplex filters and 8 dB slope. Measured with 5% OMI, –6 dBm optical input, 113 dBµV (53 dBmV) RF output level, no optical AGC.
8. ARRIS accessories should be used for guaranteed performance; using third party accessories may result in degraded and/or intermittent performance.
9. Measured at the output of the bulkhead connector.
10. All performance specifications measured over a 6 dB (pure glass) fiber link using 40 MHz noise loading with an optical receiver causing no degradation to performance.
11. Bit Error Rate (BER) performance is measured with QPSK/16-QAM loading over 6 dB pure fiber link for a BER of 10^{-6}. All measurements are typical.
12. DC current draw requirements for Value Max transponder and daughter card: add 55 mA @ 24 V. All values assume the use of a 1 GHz NOR receiver; the use of a legacy NOR will increase the DC current draw by 140 mA each.

85/105 MHz Split General Node Specifications

Characteristics	Specification
General	
Number of Active RF/AC Ports	4
Number of AC Only Ports	2
Housing Passband, MHz	1006
Port Impedance, Ω	75
AC Current Passing, A (All Ports)	15
Operating Temperature Range, °C	–40 to 60
Forward Path Specifications	
Optical Specifications	
Optical Input Wavelength, nm	1290 to 1600
Optical Input Range, dBm[1]	–3 to 3
RF Specifications	
Operating Passband, MHz	105 to 1006
Output Level @ 1006 MHz, –3 dBm input, 3.5% OMI, dBmV, min.	53.5
Level Stability, dB, max.	± 1.5
Gain Slope, dB[2]	9.8, 11.5, 12.5, 14.5, 16.5 ± 1.0
Flatness @ Gain Slope, dB	± 1.5
Return Loss, dB, min. (All RF Ports)	16.0
Port to Port Isolation, dB, typ.	60
Testpoints	
Forward Output, Directional, dB	–20 ± 0.75
Receiver (NOR) Input Optical Level Testpoint	1V/mW ± 10%
79 NTSC Channel Performance[3,4]	
Frequency, MHz	1006/870/550/105
Output Level, dBmV[5]	53.5/51.2/45.7/37.9
Carrier to Noise Ratio, 4 MHz, 75 Ω, dB	57, 0 dBm input
Composite Triple Beat, –dBc	73
Composite 2IM, –dBc	67
Cross Modulation, per NCTA std., –dB	70
Composite Intermodulation Noise, dB[6]	62.5
Composite Intermodulation Noise, dB[7]	68.5
Chrominance to Luminance Delay	
Channel 98, ns max./3.58 MHz	15
Channel 99, ns max./3.58 MHz	9
Hum Modulation, time domain @ 15 A	
105–1006 MHz, –dBc	60
Gain Control, plug-in PADs[8]	10-Ax-WC (0–26 dB); 9-A0-S to 9-A9-S in 1 dB steps (NOR)
Equalization[8]	
1 GHz	GEQL-1GHZ-000-1 (0 dB), GEQL-1GHZ-020-1 to GEQL-1GHZ-130-1 (2–13 dB)
870 MHz	GEQL-870-020-1 to GEQL-870-130-1 (2–13 dB)

Characteristics	Specification
Return Path Specifications	
RF Specifications	
Operating Passband, MHz	5 to 85
Optimum RF Input Level, dBmV/6 MHz	12
Gain Slope, dB	± 1.0
Flatness @ Gain Slope, dB	± 1.0
RF Stability, dB	± 2.5
Return Loss, dB (All RF Ports)	16.0
Port to Port Isolation, dB, typ.	50
Testpoints	
RF Input, Directional, dB	–20 ± 0.75
Analog Transmitter Output Optical Power	1V/mW ± 10%
Group Delay	
5.5 to 7 MHz, ns, max.	62
83.5 to 85 MHz, ns, max.	20
Hum Modulation (Time Domain @ 15 A)	
5 to 10 MHz, dB	55
11 to 85 MHz, dB	60
Gain Control, plug-in PADs[8]	10-A0-WC to 10-A19-WC (0–19 dB, in 1 dB steps) or Amini-0 to Amini-20 (0 to 20 dB, in 1 dB steps)
OM3100 w/ Isolated 1310 DFB and 1550 DFB Analog TX Specifications	
Transmitted Wavelength, nm	1310 ± 20, 1550 ± 25
Output Power, @ connector output, dBm[9]	3.0 ± 1.0
NPR/Dynamic Range, dB[10]	41/12
Peak NPR, dB, typ.[10]	48
BER Dynamic Range, QPSK/16-QAM/64-QAM, dB[10, 11]	45/35/25
OM3100 w/ Isolated CWDM DFB Analog TX Specifications	
Transmitted Wavelength, nm	1471 to 1611 ± 6.5 nm (8 CWDM channels, 20 nm spacing)
Output Power, @ connector output, dBm[9]	3.0 ± 1.0
NPR/Dynamic Range, dB[10]	35/15
Peak NPR, dB, typ.[10]	45
BER Dynamic Range, QPSK/16-QAM/64-QAM, dB[10,11]	45/35/25

Powering Requirements[12]	DC Curr. (A, max.) @ 24 V	DC Pwr (W)	AC I/P Current @ 60/90 V (A)	AC I/P Pwr (W)
1 x 3/4 x 1 w/ 1310/1550 new DFB NRT	2.175	52.2	1.09/0.806	59.3
1 x 3/4 x 1 w/ 1310 legacy DFB NRT	2.4	57.6	1.21/0.866	65.1
1 x 3/4 x 1 w/ 1310/1550 CWDM DFB NRT	2.55	61.2	1.292/0.905	69.1
1 x 3 Redundant w/ 1310/1550 new DFB NRT	2.725	65.4	1.38/0.956	73.6
1 x 3 Redundant w/ 1310 legacy DFB NRT	3.175	76.2	1.624/1.09	85.6
1 x 3 Redundant w/ 1310/1550 CWDM NRT	3.475	83.4	1.79/1.183	93.6
1 x 4/4 x 1 w/ 1310/1550 new DFB NRT	2.71	65.04	1.28/0.85	76.52
1 x 4/4 x 1 w/ 1310 legacy DFB NRT	2.93	70.32	1.38/0.92	82.73
1 x 4/4 x 1 w/ 1310/1550 CWDM DFB NRT	3.08	73.92	1.45/0.97	86.96
1 x 4/4 x 1 Redundant w/ 1310/1550 new DFB NRT	3.21	77.04	1.51/1.01	90.64
1 x 4/4 x 1 Redundant w/ 1310 legacy DFB NRT	3.66	87.84	1.72/1.15	103.34
1 x 4/4 x 1 Redundant w/ 1310/1550 CWDM NRT	3.96	95.04	1.86/1.24	111.81
2 x 2 w/ 1310/1550 new DFB NRT	3.41	81.84	1.60/1.07	96.28
2 x 2 w/ 1310 legacy DFB NRT	3.86	92.64	1.82/1.21	108.99
2 x 2 w/ 1310/1550 CWDM NRT	4.16	99.84	1.96/1.31	117.46

Specification Document Number 1506246 Rev A

NOTES:

1. Circuit resiliency to 5 dBm.
2. Typical slope is 6.5 dB with no EQ installed. Slope is defined as the difference between the highest and lowest specified frequency on a straight line determined by applying a best fit/least squared formula to the measured response.
3. The distortion values listed are for the node only. To obtain a particular link performance, combine the listed node performance values with the applicable transmitter performance values.
4. Analog channels occupying the 105 to 550 MHz frequency range with digitally compressed channels or equivalent broadband noise to 1006 MHz at levels 6dB below equivalent video channels.
5. At the specified operational tilt of 16.5 dB, the maximum output level for 870 MHz or 1006 MHz loading is 56.5 dBmV at the highest frequency.
6. Systems operating with digitally compressed channels or equivalent broadband noise from 550 to 1006 MHz at levels 6 dB below equivalent video channels will experience a composite distortion (CIN) appearing as noise in the 105 to 550 MHz frequency spectrum.
7. Systems operating with digitally compressed channels or equivalent broadband noise from 550 to 870 MHz at levels 6 dB below equivalent video channels will experience a composite distortion (CIN) appearing as noise in the 105 to 550 MHz frequency spectrum.
8. ARRIS accessories should be used for guaranteed performance; using third party accessories may result in degraded and/or intermittent performance.
9. Measured at the output of the bulkhead connector.
10. All performance specifications measured over a 6 dB (pure glass) fiber link using 40 MHz noise loading with an optical receiver causing no degradation to performance.
11. Bit Error Rate (BER) performance is measured with QPSK loading over 6 dB pure fiber link for a BER of 10^{-6}. All measurements are typical.
12. DC current draw requirements for Value Max transponder and daughter card: add 55 mA @ 24 V. All values assume the use of a 1 GHz NOR receiver; the use of a legacy NOR will increase the DC current draw by 140 mA each.

OM3100 Network Optical Receiver (NOR) Specifications

Characteristics	Standard Gain Rx	High Gain Rx
Optical Specifications		
Optical Wavelength, nm	1290 to 1600	1290 to 1600
Optical Input Return Loss, dB, min.	45	45
Equivalent Noise Input, $pA/Hz^{0.5}$	8	5
Optical Input Range, dBm[1]	–3 to 3	–3 to 3
Optical Power Threshold Alarm Limits, dBm	User-settable: –10 to 0	User-settable: –10 to 0
RF Specifications		
Impedance, Ohms	75	75
Frequency Range, MHz	40 to 1002	40 to 1006
RF Output Level, dBmV, min.	22.5[2]	27.5[3]
Thermal Stability, dB[4]	± 1.5	± 1.5
Slope, dB	± 0.5	1.0 ± 0.5
Flatness, dB[5]	± 0.6	± 0.6
Return Loss, dB min.	14.0	16.0
Testpoint Specifications		
Output RF Testpoint, dB	–30 ± 1.0	–20 ± 1.0
Optical Power Monitor	1 V/mW ± 10%	1 V/mW ± 10%
Optical Threshold Testpoint	10 VDC = 1 mW	10 VDC = 1 mW
79 NTSC Channel Performance Specifications @ Recommended Levels, typ.[6]		
Channels, Number of NTSC[7]	79	79
Frequency, MHz	1002/870/550/54	1002/870/550/54
Output Level, dBmV	22.5/22.5/22.5/22.5	27.5/27.5/27.5/27.5
Composite Triple Beat, –dBc	86	77
Cross Modulation, per NCTA std., –dB	81	75
Composite 2IM, –dBc	82	68
Composite Intermodulation Noise CIN, dB[7]	62	59
LED Indicators		
OPT ALM, Optical Power Threshold LED	Red: optical input below threshold	Red: optical input below threshold
PWR, DC Power LED	Green: DC power okay Off: DC power failure	Green: DC power okay Off: DC power failure
Powering Requirements		
Supply Voltages, Vdc	24	24
DC Current, mA, max.	365	350
Power Consumption, W, max.	8.7	8.4
Environmental Specifications		
Operating Temperature, ° C [8]	–20 to 85	–20 to 85
Storage Temperature, ° C	–40 to 85	–40 to 85
Relative Operating Humidity, %, noncondensing	95	95
Gain Control		
Plug-in PAD [9]	9-A0-S to 9-A19-S (0 to 19 dB, in 1 dB steps)	9-A0-S to 9-A19-S (0 to 19 dB, in 1 dB steps)

Specification Document Number 1502438 Rev C (Standard Gain Rx), 1507207 Rev B (High Gain Rx)

NOTES:

1. Circuit resiliency to +5 dBm.
2. RF output level is 22.5 dBmV minimum @ 1002 MHz with a –3.0 dBm received power, transmitter OMI of 3.5%, and a 0 dB PAD installed in Rx at **9-Axx ATTEN** location.
3. RF output level is 27.5 dBmV minimum @ 1006 MHz with a –3.0 dBm received power, transmitter OMI of 3.5%, and a 0 dB PAD installed in Rx at **9-Axx ATTEN** location.
4. The receiver module is designed to operate in a node application with external ambient temperature ranging from –40°C to 60°C.
5. Flatness is measured with respect to slope.
6. The distortion values listed are for the NOR only. To obtain a particular link performance, combine the listed NOR performance values with the applicable NRT performance values.
7. Systems operating with digitally compressed channels or equivalent broadband noise from 550 to 1006 MHz at levels 6 dB below equivalent video channels will experience a composite distortion (CIN) appearing as noise in the 54 to 550 MHz frequency spectrum. Distortion values are typical with an input of 0 dBm @ 3.5% OMI.
8. The NOR is designed to operate in a node application with external ambient temperature ranging from –40 to 60° C.
9. ARRIS accessories should be used for guaranteed performance; using third party accessories may result in degraded and/or intermittent performance.

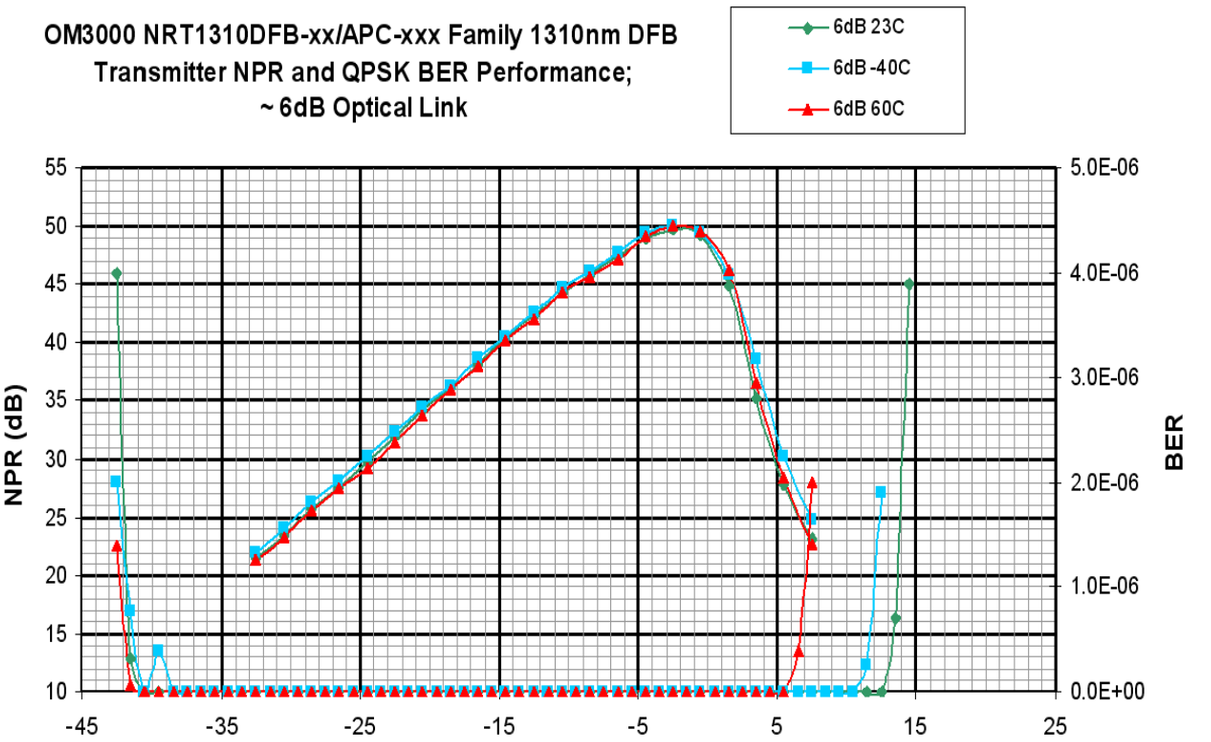
OM3100 NRT Analog Return Transmitter Specifications

Characteristic	Specification		
Optical Specifications	**NRT-1310-DFB**	**NRT-1550-DFB**	**NRT-xxxxCWDM**
Output Power, dBm	3 ± 1	3 ± 1	3 ± 1
Transmitted Wavelength, nm	1310 ± 20	1550 ± 25	1471, 1491, 1511, 1531, 1551, 1571, 1591, 1611; ± 6.5
Laser Type, Isolated Uncooled	DFB	DFB	DFB
Optical Power Voltage Testpoint	1 mW/V ± 10%	1 mW/V ± 10%	1 mW/V ± 10%
Optical Connector Types	SC/APC, FC/APC	SC/APC, FC/APC	SC/APC, FC/APC
RF Specifications			
Impedance, Ohms	75	75	75
RF Bandpass, MHz	5 to 200	5 to 200	5 to 200
Return Loss, dB,[2,3]	–16	–16	–16
Connector Type (75 ohm jack)	mini-SMB	mini-SMB	mini-SMB
RF Testpoint Insertion Loss, dB[4]	9.0 ± 0.5	9.0 ± 0.5	9.0 ± 0.5
Flatness, dB, max.[5]	± 0.75	± 0.75	± 0.75
Gain Slope, dB, max.[5]	± 0.5	± 0.5	± 0.5
RF Level Stability Over Temp., dB	± 2.5	± 2.5	± 3.0
Manual Gain Control Range, dB	>8	>8	>8
Reverse Spurious, dBc	<–50	<–50	<–50
Operating Temperature, °C[6]	–30 to 85	–30 to 85	–30 to 85
Powering Specifications			
Supply Voltage, VDC	24 ± 0.5	24 ± 0.5	24 ± 0.5
Current Draw, mA, max.	225	225	600
Performance (35/60 MHz of PRN)[7]			
Optimum Transmitter Input Level, dBmV/6 MHz	6 (–62 dBmV/Hz)	6 (–62 dBmV/Hz)	6 (–62 dBmV/Hz)
Optimum RF Monitor Point Level, dBmV/6 MHz	–3 (–71 dBmV/Hz)	–3 (–71 dBmV/Hz)	–3 (–71 dBmV/Hz)
NPR/Dynamic Range, dB[8]	41/12	41/12	35/15
NPR Peak, 35/60 MHz Loading, dB[8,9]	48/47	48/47	45/44
BER Dynamic Range			
QPSK @ 10^{-6}, 35/60 MHz Load, dB[10]	45/43	45/43	45/43
16-QAM @ 10–6, 35/60 MHz Load, dB	35/33	35/33	35/33
EMS Monitor Status			
Laser Shut Down			
Enabled, V	5 ± 0.25	5 ± 0.25	5 ± 0.25
Disable, V	0 + 0.25	0 + 0.25	0 + 0.25

Specification Document Number 601290 Rev H, 601292 Rev H, 601291 Rev J

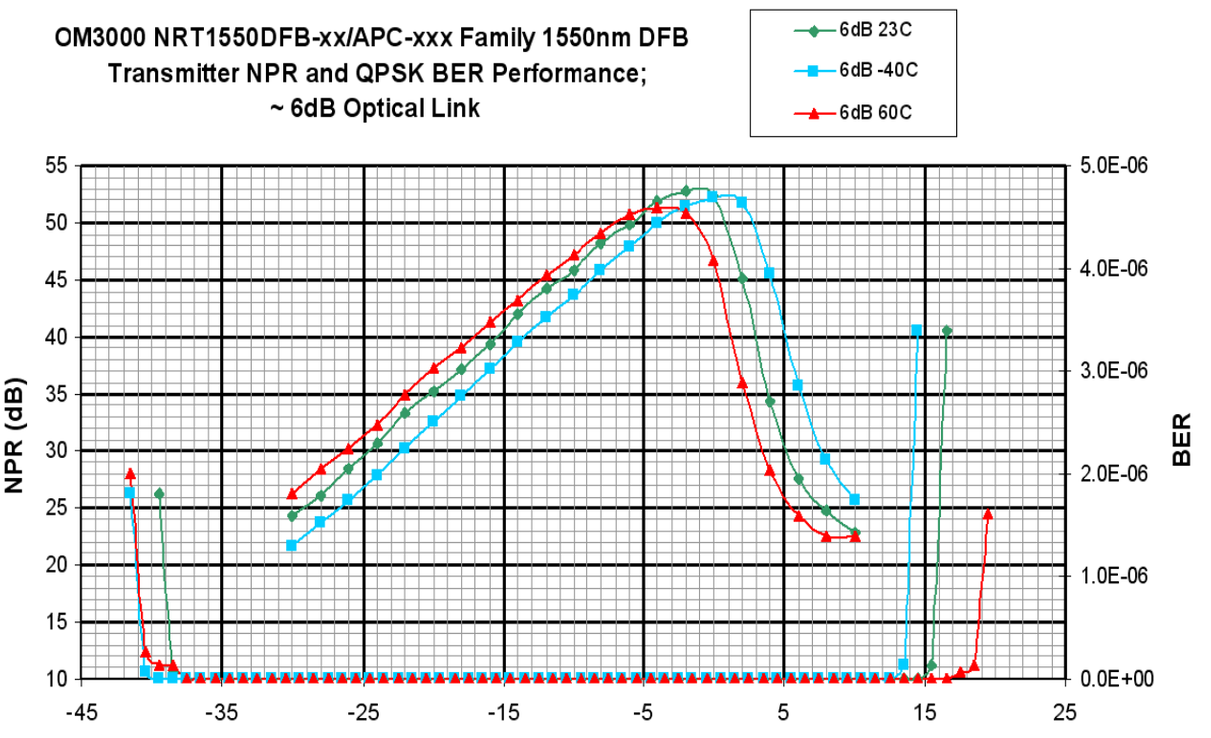
NOTES:

1. Measured at output of bulkhead connector.
2. Return Loss is specified from maximum gain to 8 dB of attenuation.
3. Measured from 5-100 MHz.
4. RF testpoint is –9 dB referenced to the transmitter input, with transmitter set to maximum gain.
5. Flatness is measured with respect to gain slope. Gain slope is measured as a straight line from 5 to 200 MHz.
6. Denotes transmitter temperature. Product must operate in a node from –40 to 60° C.
7. All performance specifications measured while installed in an OM3100 node with a NOR causing low degradation to performance (~0.5 dB).
8. Measured over 6 dB fiber link using 35 MHz PRN loading.
9. Typical NPR performance measurements taken at room temperature.
10. BER performance is measured with QPSK loading over 6 km pure fiber link for a BER of 10^{-6}.



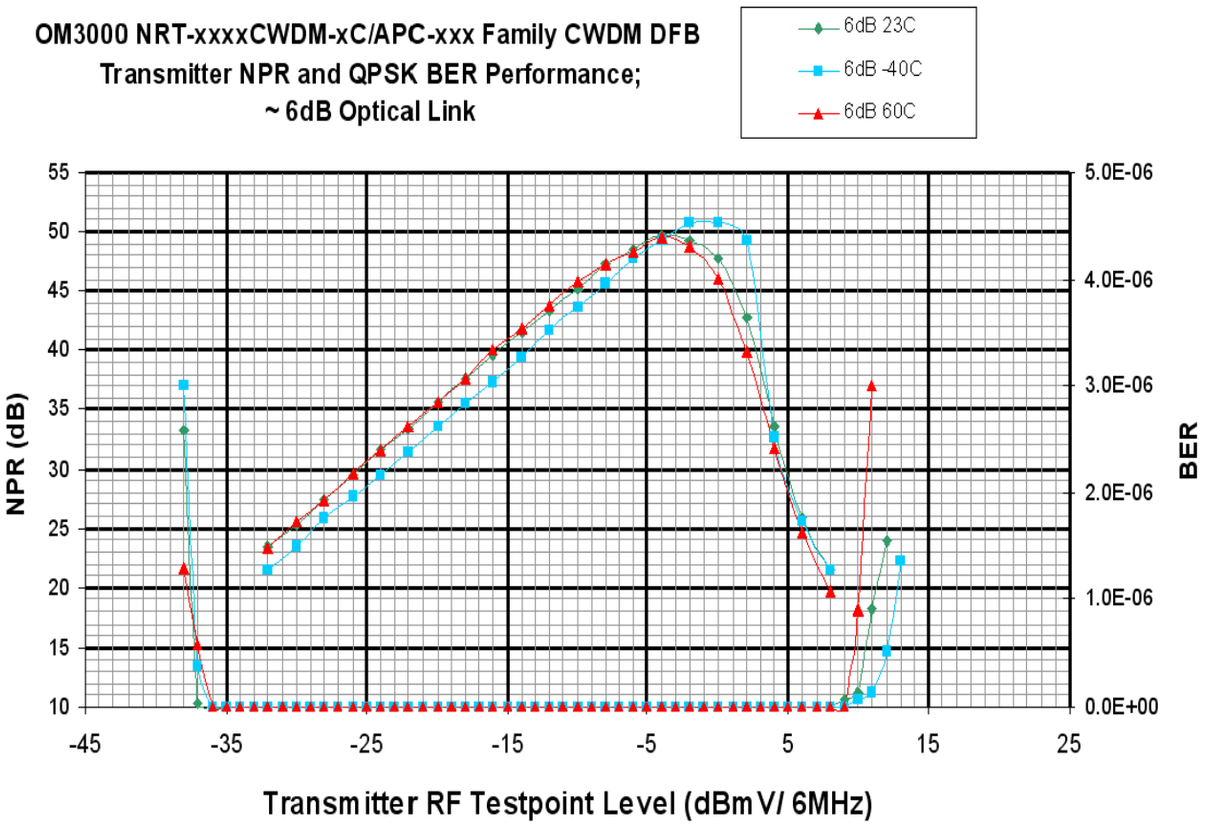
Transmitter RF Testpoint Level (dBmV/6 MHz)

Subtract 67.78 to Convert dBmV/6 MHz to dBmV/Hz



Transmitter RF Testpoint Level (dBmV/6 MHz)

Subtract 67.78 to Convert dBmV/6 MHz to dBmV/Hz



(To convert dBmV/6MHz to dBmV/Hz Subtract 67.78)

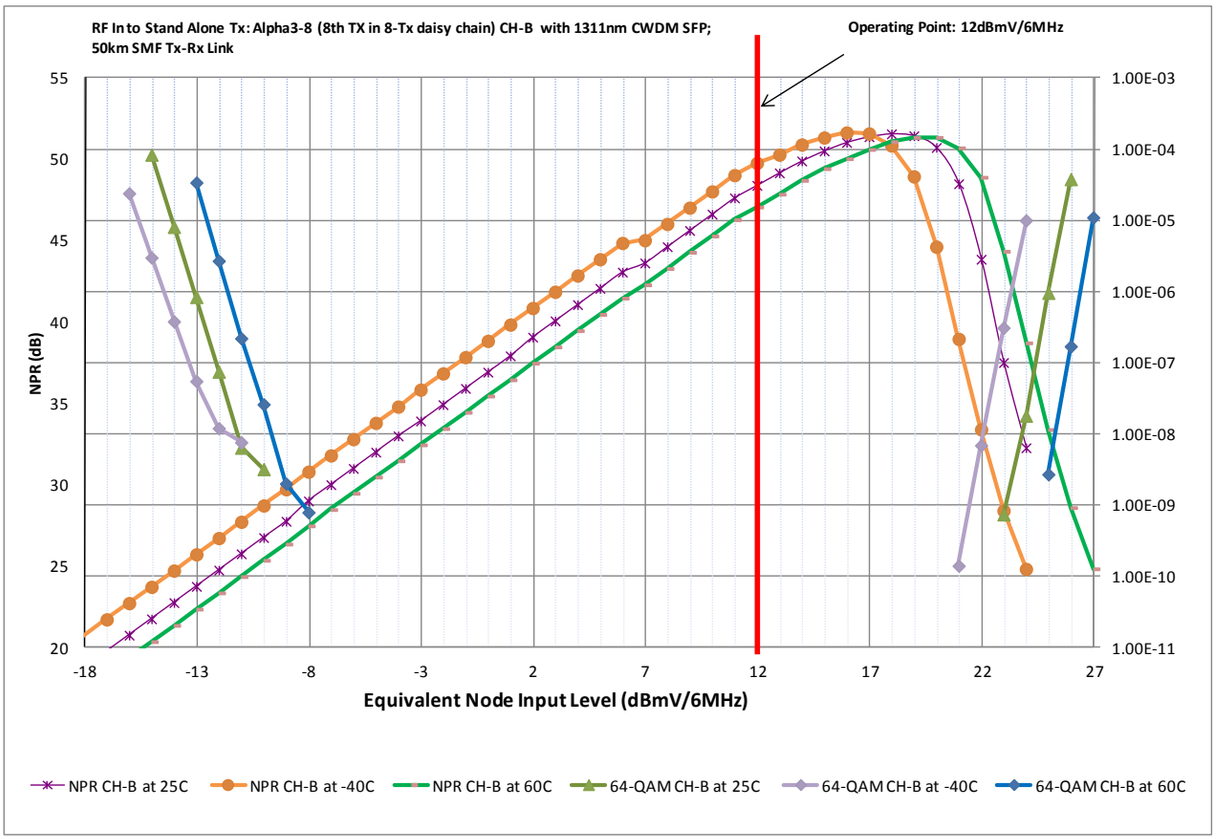
OM3100 Digital Return Processing Module Specifications

Characteristic	Specification[1]				
Optical Specifications, each channel					
A standard, industrial temperature range DWDM, CWDM, 1310 nm, or 1550 nm SFP with a data rate of 2.488 Gb/s or higher (5 to 42 MHz or 5 to 85 MHz) or 3.73 GB/s or higher (5 to 65 MHz) must be plugged into an OM3100 digital processing module.					
RF Specifications, each channel	**5 to 42 MHz**		**5 to 65 MHz**		**5 to 85 MHz**
RF Bandpass, MHz	5 to 42		5 to 65		5 to 85 MHz
RF Digitizing Resolution	10 (12 companded)		10 (12 companded)		10 (12 companded)
Data Rate, Gb/s	2.488		3.73		2.488
Flatness, dB[2]	± 0.50		± 0.50		± 0.50
Gain Slope, dB	0 ± 0.25[3]		0 ± 0.25[4]		0 ± 0.25[5]
Recommended Operational Input Level, dBmV/channel[6]	6.0		6.0		6.0
RF Gain Stability Over Temperature, dB	± 1.5		± 1.5		± 1.75
Input and Testpoint Impedance, Ohms	75		75		75
Input and Testpoint Return Loss, dB, min.	16		16		16
RF Testpoint from Transmitter Input, dB	–9 ± 1.0		–9 ± 1.0		–9 ± 1.0
Tx LED Indicators	**Ch A LED**	**Ch B LED**	**Ch A LED**	**Ch B LED**	**RF LED**
No SFP Installed/SFP Failure	solid red	solid red	solid red	solid red	solid red
Channel A RF Overdrive	flashing red	—	flashing red	—	flashing red
Channel B RF Overdrive	—	flashing red	—	flashing red	—
Laser Power and RF OK	solid green	solid green	solid green	solid green	solid green
Rx LED Indicator	**Rx LED**		**Rx LED**		No Rx LED on module
No optical input detected since SFP installed	off		Rx LED is only used for Service Aggregation (daisy chain) functionality, which is only offered for the 5 to 42 MHz Digital Processing module.		—
Optical input signal detected and lost since SFP has been installed in the module, or optical input signal detected but receiver lock not achieved since SFP has been last installed in the module	solid red				
Optical input signal detected, receiver locked to incoming signal, bit errors detected	1 red flash 🕐 off 1 second 🕐				
Normal operation without errors	1 red flash solid green				
Headend/Hub Digital Receiver Required					
Receiver Model	CHP-D1RRX-xx CHP-D1RRX-42-S CHP-D2RRX-42-xx-S		CHP-D2RRX-65-xx-S		CHP-D2RRX-85-xx-S
Powering Specifications					
Power Consumption, W, typ.	5.5		5.5		5.0
Temperature Range					
Operating Temperature, °C[7]	–20 to 85		–20 to 85		–20 to 85
System Specifications[8]					
NPR Peak, dB, typ./min.	50/48		50/48		50/48
Dynamic Range @ ≥ 40 dB NPR, dB, typ./min.	16.5/15		16/15		16/15
BER Dynamic Range @ < 10^{-6} BER, dB	28 (64-QAM), 34 (16-QAM), 45 (QPSK)		26 (64-QAM), 32 (16-QAM), 43 (QPSK)		26 (64-QAM), 32 (16-QAM), 43 (QPSK)
Link Gain, dB[9]	31		30		27
Link Flatness, dB, typ./max.	± 0.75/±1.00		± 0.75/±1.00		± 0.75/±1.00

NOTES:

1. ARRIS guarantees digital return link performance specification only when using an ARRIS supplied SFP.
2. Flatness is measured with respect to gain slope.
3. Gain slope is measured as a straight line from 5 to 42 MHz.
4. Gain slope is measured as a straight line from 5 to 65 MHz.
5. Gain slope is measured as a straight line from 5 to 85 MHz.
6. Recommended return node input is 12 dBmV/channel and Digital Processing module input is 6 dBmV/channel. The level at the Digital Processing module testpoints are 9 dB lower than the RF input at the Digital Processing module. Therefore, the recommended Digital Processing module testpoint levels are –3 dBmV/6 MHz channel.
7. Denotes transmitter temperature. Temperature range when installed in node must be –40 to 60° C, ambient.
8. System specifications with up 100 km fiber link for 42 MHz or 85 MHz and 80 km fiber link for 65 MHz.
9. With maximum gain at receiver, from input of transmitter to the output of the receiver.

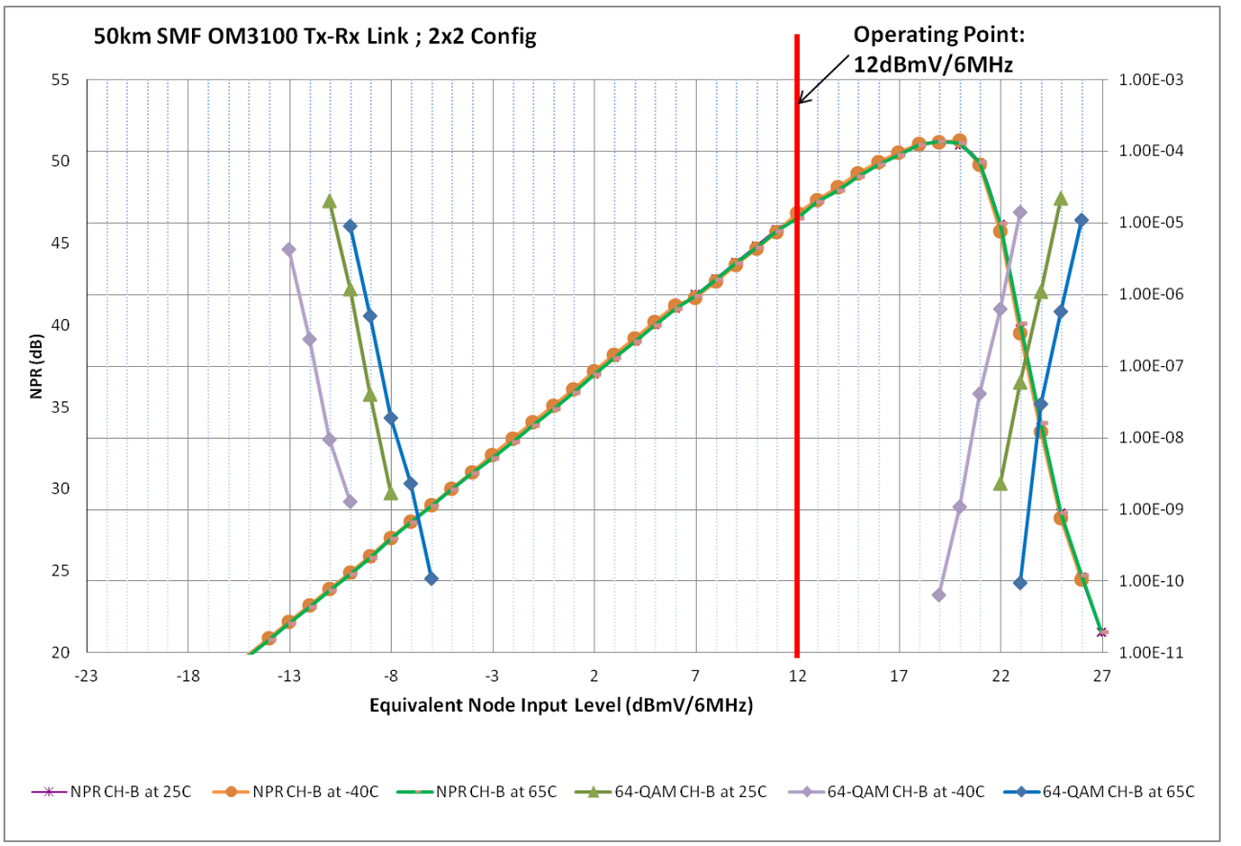
OM3100 NPR/BER 64-QAM Curve with 2:1 TDM 5 to 42 MHz Digital Return Processing Module and SFP



NPR/BER Curve Obtained Using a 2:1 TDM Digital Return Processing Module Installed in an OM3100 Node with a CWDM SFP through a 50 km SMF, and fully loaded from 5 to 42 MHz with six 64-QAM Channels.

Refer to the OM3100 Technical Overview Document or the OM3100 Equipment Manual (P/N 1501843) for complete specifications. Specifications are subject to change without notice.

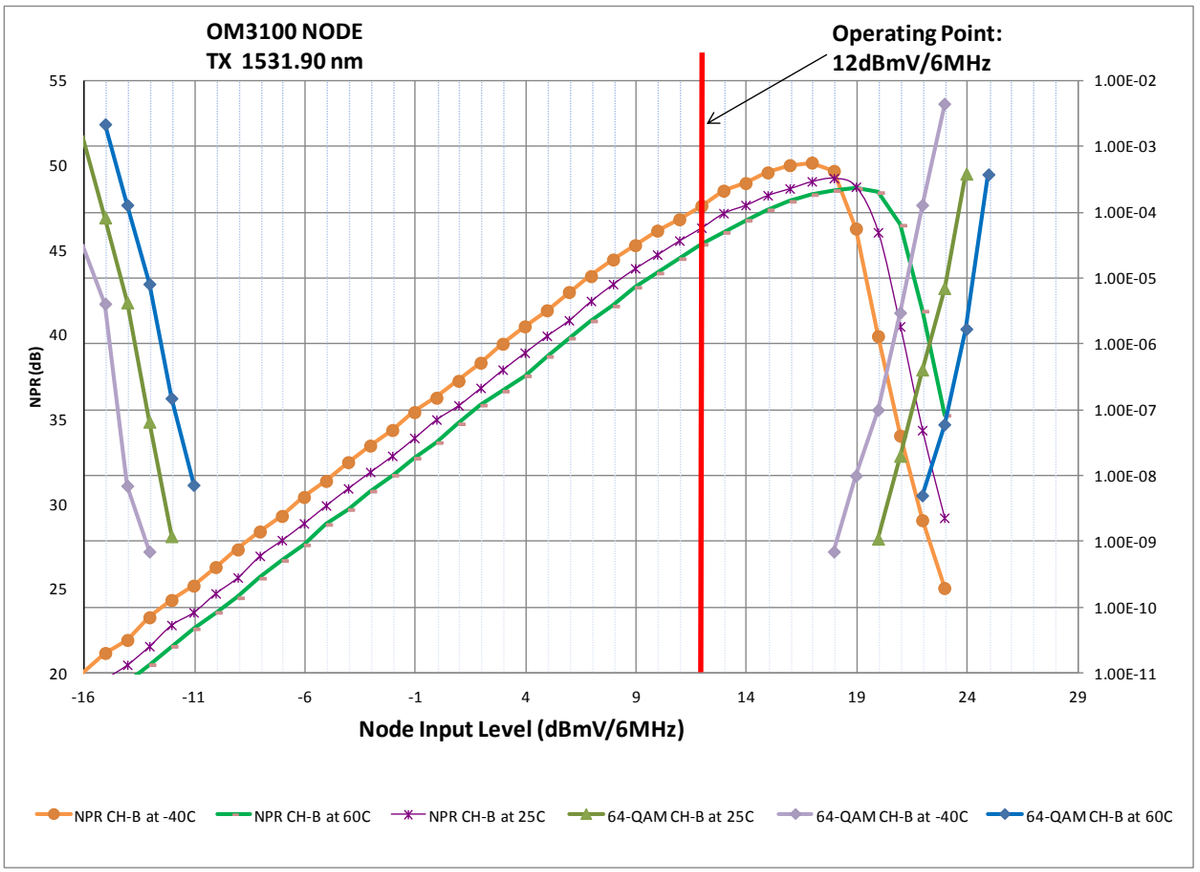
OM3100 NPR/BER 64-QAM Curve with 2:1 TDM 5 to 65 MHz Digital Return Processing Module and SFP



NPR/BER Curve Obtained Using a 2:1 TDM Digital Return Processing Module Installed in an OM3100 Node with a CWDM SFP through a 50 km SMF, and fully loaded from 5 to 65 MHz with ten 64-QAM Channels.

Refer to the OM3100 Technical Overview Document or the OM3100 Equipment Manual (P/N 1501843) for complete specifications. Specifications are subject to change without notice.

OM3100 NPR/BER 64-QAM Curve with 1:1 TDM 5 to 85 MHz Digital Return Processing Module and SFP



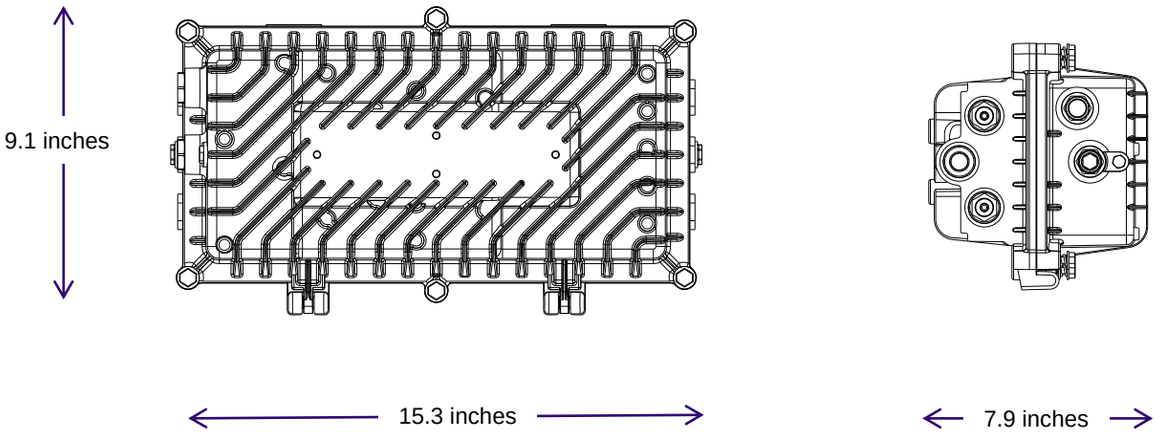
NPR/BER Curve Obtained Using a Digital Return Processing Module Installed in an Opti Max3100 Node with a CWDM SFP through a 80 km SMF, and fully loaded from 5 to 85 MHz with 13 64-QAM Channels.

Refer to the OM3100 Technical Overview Document or the OM3100 Equipment Manual (P/N 1501843) for complete specifications. Specifications are subject to change without notice.

9-DN Series 4-Port Housing Dimensions (Legacy Philips)

Characteristics	Specifications
Uncrated	9.1 x 15.3 x 7.9 inches (23.1 x 38.9 x 20.1 cm)
Crated	13.20 x 19.13 x 11.63 inches (33.5 x 48.6 x 29.5 cm)
Crated weight, approx.	22.92 lbs. (10.4 kg)[1]

1. Approximate weight for a fully-configured node built with two NORs, two NRTs, a Value Max transponder, and appropriate forward configuration module accessories.



Visit http://www.arrisi.com for more information about the Opti Max™ OM3100 1 GHz 2 x 2 Segmentable Node and other Opti Max™ products.

Contact Customer Care for product information and sales

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Specifications are subject to change without notice.

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