

WaveSmart®

Wave Division Multiplexing (WDM)

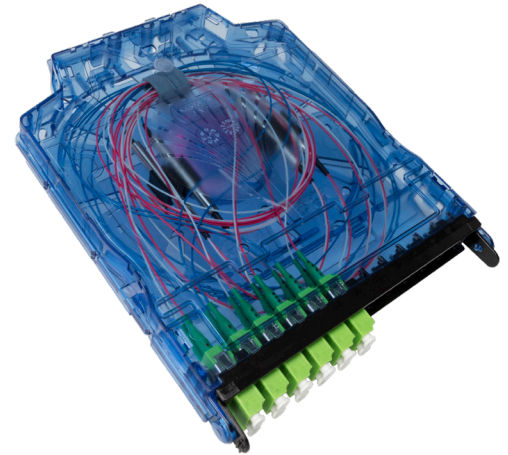


Application

These products are needed when a passive multiplexing or demultiplexing unit is required in a central office environment. They are used in CATV headends and telephone company central offices.

Description

Wavelength Division Multiplexing increases fiber capacity by combining (mux) and separating (demux) multiple input channels over a single fiber output. Wavelength division multiplexers let you expand the bandwidth of optical communication networks and can be used at several locations within each network. Clearfield® provides WDMs for singlemode fiber applications.



Coarse Wavelength Division Multiplexing

CWDMs combine or multiplex more than one wavelength over one fiber. This is done by using fiber pigtail collimators and wavelength/light filters that are aligned and mounted in a glass tube and typically packaged in a stainless steel tube for more protection. The wavelength/light filters used only allow specific wavelengths of light to pass through the filter and the remainder of the wavelengths to be reflected back. CWDMs can also be used to separate or demultiplex more than one signal using the same device and transmitting the signal in the opposite direction. CWDMs have channel spacing of 20nm with a working channel passband of ± 6.5 nm from the wavelengths center. This allows you to add multiple wavelengths on to one fiber while keeping within the operating wavelengths of 1260nm to 1620nm. The wavelengths used are defined by the International Telecommunications Union; reference ITU G.694.2 for the ITU CWDM Wavelength Grid. Note: as of June 2002, 18 center wavelengths, from 1270nm to 1610nm, were listed.

Dense Wavelength Division Multiplexing

Dense Wavelength Division Multiplexing or DWDM is a technology which multiplexes or demultiplexes a number of optical carrier signals onto a single optical fiber by using different wavelengths (i.e. colors) of laser light. This technique enables bidirectional communications over one strand of fiber, as well as multiplication of capacity. DWDM signals within the 1550nm band which are wavelengths between approximately 1530–1565nm (C band) and/or 1570–1625nm (L band) adhering to the DWDM ITU-T G.694.1 frequency grid. DWDMs allow you to increase your wavelength capacity. DWDM products can offer multiplexing of multiple channels using 200 GHz and 100 GHz spacing with the option to have an added Expansion port and/or Monitor port. All of the Clearfield Passive Products are Telcordia GR-1209 and GR-1221 certified.

Packaging Options

- Clearview® Cassette
- Clearview xPAK
- Discrete (unpackaged solution)
- Pizza Box
- LGX

Features and Benefits

Integrity

- Compliant to Telcordia GR-1221
- Consistent performance

Protection

- Wide operating temperature range
- Low polarization sensitivity
- No epoxy in optical path

Access

- Transport protocol independent
- Low insertion loss
- Minimal optical loss

Investment

- Wide bandwidth (CWDM/DWDM)
- Mux, demux and universal options available
- PDL = < 0.2 dB
- Return Loss = > 45 dB

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Technical Specifications

WaveSmart Wave Division Multiplexing	Channel Spacing	Wavelength Range	ITU Starting Wavelength	Start Channel
CWDM	20nm	1260 – 1650	1471nm 1491nm 1611nm	N/A
DWDM	100 GHz	1520 to 1560	N/A	ITU – T GRID
DWDM	200 GHz	1520 to 1560	N/A	ITU – T GRID

FSAN WDM Specifications

Parameter	Ports	Specifications
Pass Channel Wavelength	P1 to P3	1260nm to 1360nm
		1480nm to 1500nm
Reflect Channel Wavelength	P1 to P2	1540 dB to 1565 dB
Insertion Loss	P1 to P3	< 0.8 dB
	P1 to P2	< 0.5 dB
Isolation	N/A	> 25 dB
		> 18 dB/ °C
PDL	N/A	< 0.1 dB
Ripple	N/A	< 0.3 dB
Return Loss	N/A	> 45 dB
Operating Temperature Range	N/A	-40°C to 85°C
Storage Temperature Range	N/A	-40°C to 85°C
Maximum Input Power	N/A	500 mW
Mechanical Dimension	N/A	5 mm x 34 mm

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Wave Division Multiplexing (WDM)



200 GHz DWDM

Parameter	Value				
	Add/Drop	4 CH	8 CH	16 CH	20 CH
Wavelength Range	1520 to 1560nm	1520 to 1560nm	1520 to 1560nm	1520 to 1560nm	1520 to 1560nm
Central Wavelength	ITU-T G.694.1	ITU-T G.694.1	ITU-T G.694.1	ITU-T G.694.1	ITU-T G.694.1
Bandwidth	C ± 0.25nm	C ± 0.25nm	C ± 0.25nm	C ± 0.25nm	C ± 0.25nm
Insertion Loss	< 0.8 dB	< 2.4 dB	< 3.4 dB	< 5.8 dB	< 6.5 dB
Insertion Loss - Reflection	< 0.4 dB	N/A	N/A	N/A	N/A
Isolation	> 30 dB	> 30 dB	> 30 dB	> 30 dB	> 30 dB
Isolation - Reflection	> 12 dB	N/A	N/A	N/A	N/A
PDL	< 0.2 dB	< 0.2 dB	< 0.2 dB	< 0.2 dB	< 0.2 dB
Return Loss	> 45 dB	> 45 dB	> 45 dB	> 45 dB	> 45 dB
Operation Temperature	-40°C to 85°C	-40°C to 85°C	-40°C to 85°C	-40°C to 85°C	-40°C to 85°C
Storage Temperature	-40°C to 85°C	-40°C to 85°C	-40°C to 85°C	-40°C to 85°C	-40°C to 85°C
Maximum Input Power	500 mW	500 mW	500 mW	500 mW	500 mW
Mechanical Dimensions	5 mm x 34 mm	100 mm x 80 mm x 10 mm	100 mm x 80 mm x 10 mm	100 mm x 80 mm x 10 mm	100 mm x 80 mm x 10 mm

100 GHz DWDM

Parameter	Value				
	Add/Drop	4 CH	8 CH	16 CH	40 CH
Wavelength Range	1520 to 1560nm	1520 to 1560nm	1520 to 1560nm	1520 to 1560nm	1520 to 1560nm
Central Wavelength	ITU-T G.694.1	ITU-T G.694.1	ITU-T G.694.1	ITU-T G.694.1	ITU-T G.694.1
Bandwidth	C ± 0.11nm	C ± 0.11nm	C ± 0.11nm	C ± 0.11nm	C ± 0.11nm
Insertion Loss	< 0.8 dB	< 2.4 dB	< 3.4 dB	< 5.8 dB	< 6.5 dB
Insertion Loss - Reflection	< 0.4 dB	N/A	N/A	N/A	N/A
Isolation	> 30 dB	> 30 dB	> 30 dB	> 30 dB	> 30 dB
Isolation - Reflection	> 12 dB	N/A	N/A	N/A	N/A
PDL	< 0.2 dB	< 0.2 dB	< 0.2 dB	< 0.2 dB	< 0.2 dB
Return Loss	> 45 dB	> 45 dB	> 45 dB	> 45 dB	> 45 dB
Operation Temperature	-40°C to 85°C	-40°C to 85°C	-40°C to 85°C	-40°C to 85°C	-40°C to 85°C
Storage Temperature	-40°C to 85°C	-40°C to 85°C	-40°C to 85°C	-40°C to 85°C	-40°C to 85°C
Maximum Input Power	500 mW	500 mW	500 mW	500 mW	500 mW
Mechanical Dimensions	5 mm x 34 mm	100 mm x 80 mm x 10 mm	100 mm x 80 mm x 10 mm	100 mm x 80 mm x 10 mm	120 mm x 75 mm x 13.5 mm

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CWDM

Parameter	Value		
	Add/Drop	4 CH	8 CH
Wavelength Range	1260 to 1650nm	1260 to 1650nm	1260 to 1650nm
Central Wavelength	ITU-T G.694.2	ITU-T G.694.2	ITU-T G.694.2
Bandwidth	C ± 6.5nm	C ± 6.5nm	C ± 6.5nm
Insertion Loss	< 0.8 dB	< 2.0 dB	< 3.0 dB
Insertion Loss - Reflection	< 0.4 dB	N/A	N/A
Isolation	> 30 dB	> 30 dB	> 30 dB
Isolation - Reflection	> 12 dB	N/A	N/A
PDL	< 0.2 dB	< 0.2 dB	< 0.2 dB
Return Loss	> 45 dB	> 45 dB	> 45 dB
Operation Temperature	-40°C to 85°C	-40°C to 85°C	-40°C to 85°C
Storage Temperature	-40°C to 85°C	-40°C to 85°C	-40°C to 85°C
Maximum Input Power	500 mW	500 mW	500 mW
Mechanical Dimensions	5 mm x 34 mm	100 mm x 80 mm x 10 mm	100 mm x 80 mm x 10 mm

Coarse Wavelength Division Multiplexing (CWDM) ITU Channel/Wavelength Chart

ITU Channel (xx or yy)	Wavelength	ITU Channel (xx or yy)	Wavelength	ITU Channel (xx or yy)	Wavelength
27	1270nm	41	1410nm	55	1550nm
29	1290nm	43	1430nm	57	1570nm
31	1310nm	45	1450nm	59	1590nm
33	1330nm	47	1470nm	61	1610nm
35	1350nm	49	1490nm	63	1630nm
37	1370nm	51	1510nm	65	1650nm
39	1390nm	53	1530nm		

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Wave Division Multiplexing (WDM)



Dense Wavelength Division Multiplexing (DWDM)

ITU Grid: C-Band, 100 GHz Spacing

Channel (#)	Frequency (GHz)	Wavelength (NM)
1	190100	1577.03
2	190200	1576.20
3	190300	1575.37
4	190400	1574.54
5	190500	1573.71
6	190600	1572.89
7	190700	1572.06
8	190800	1571.24
9	190900	1570.42
10	191000	1569.59
11	191100	1568.77
12	191200	1567.95
13	191300	1567.13
14	191400	1566.31
15	191500	1565.50
16	191600	1564.68
17	191700	1563.86
18	191800	1563.05
19	191900	1562.23
20	192000	1561.42
21	192100	1560.61
22	192200	1559.79
23	192300	1558.98
24	192400	1558.17
25	192500	1557.36
26	192600	1556.56
27	192700	1555.75
28	192800	1554.94
29	192900	1554.13
30	193000	1553.33
31	193100	1552.52
32	193200	1551.72
33	193300	1550.92
34	193400	1550.12
35	193500	1549.32
36	193600	1548.52

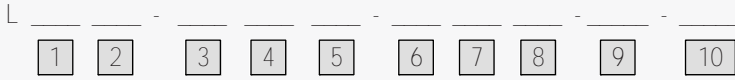
Channel (#)	Frequency (GHz)	Wavelength (NM)
37	193700	1547.72
38	193800	1546.92
39	193900	1546.12
40	194000	1545.32
41	194100	1544.53
42	194200	1543.73
43	194300	1542.94
44	194400	1542.14
45	194500	1541.35
46	194600	1540.56
47	194700	1539.77
48	194800	1538.98
49	194900	1538.19
50	195000	1537.40
51	195100	1536.61
52	195200	1535.82
53	195300	1535.04
54	195400	1534.25
55	195500	1533.47
56	195600	1532.68
57	195700	1531.90
58	195800	1531.12
59	195900	1530.33
60	196000	1529.55
61	196100	1528.77
62	196200	1527.99
63	196300	1527.22
64	196400	1526.44
65	196500	1525.66
66	196600	1524.89
67	196700	1524.11
68	196800	1523.34
69	196900	1522.56
70	197000	1521.79
71	197100	1521.02
72	197200	1520.25

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Configured Part Numbers



1 Component Package

- A = Discrete – 250 μ m (0.5 meter legs)
- B = Discrete – 250 μ m (1 meter legs)
- C = Discrete – 900 μ m (0.5 meter legs)
- D = Discrete – 900 μ m (1 meter legs)
- E = Discrete – 2 mm rugged (0.5 meter legs)
- F = Discrete – 2 mm rugged (1 meter legs)
- G = xPAK (no longer used, see N or O)
- H = LGX
- M = Pizza box/1 rack unit
- N = xPAK LGX front panel
- O = xPAK standard panel
- P = LGX Blade
- Q = Module 100x80x10 mm – 900 μ m (0.5 meter legs)
- R = Module 100x80x10 mm – 900 μ m (1 meter legs)
- S = Module 100x80x10 mm – 2 mm (0.5 meter legs)
- T = Module 100x80x10 mm – 2 mm (1 meter legs)
- U = Module 100x80x10 mm – 2 mm (51 inch legs)
- V = Module 100x80x13 mm – 2 mm (51 inch legs)
- W = Clearview Blue 1 high – no mounting ears
- Y = Clearview Blue 1 high – mounting ears
- 1 = 80x60x7 mm – 900 μ m – 0.5 meter legs
- 2 = 80x60x7 mm – 900 μ m – 1 meter legs

2 Device Type

- A = Add / drop CWDM
- B = CWDM
- C = DWDM (50 or 100 Ghz)
- D = DWDM (200 Ghz)
- E = 1310 / 1550 WDM
- F = 1310 / 1490 / 1550 FSAN WDM
- G = Circulator
- H = Drop only CWDM

3 Select Connector Style

- A = SC/UPC E = LC/UPC
- C = SC/APC G = LC/APC
- Z = N/A

4 Number of Components

- A = 1 E = 5
- B = 2 (Quad) F = 6
- C = 3 G = 7
- D = 4 (Quad) H = 8

5 Number of Channels

- XX = # of channels

6 1310 Port

- A = Included
- Z = N/A

7 Expansion Port

- A = Included
- Z = N/A

8 Test Port

- A = 1% incoming
- B = 2% incoming
- C = 3% incoming
- D = 5% incoming
- E = 7% incoming
- F = 10% incoming
- G = 1% out going
- H = 2% out going
- J = 3% out going
- K = 5% out going
- L = 7% out going
- M = 10% out going
- Z = N/A

9 Start Channel

- XX = Channel
- Z = N/A

10 Application

- M = Channel
- D = N/A
- M/D = Mux & demux
- M/M = Mux & mux
- D/D = Demux & demux
- U = Universal