



鲲游光电

North Ocean Photonics

Product Brochure

以晶圆级光学奠定光子AI的基石

Building Photonic AI on Wafer Level Optics



About North Ocean Photonics

Based in Shanghai, China, North Ocean Photonics (NOP) is a leading high-tech company specializing in wafer-level optics (WLO) and optical integration.

Leveraging extensive technical expertise and advanced manufacturing capabilities, NOP is committed to exploring cutting-edge applications in the fields of photonics and optoelectronics.



Core Team

NOP's team brings together professors and PhDs from world-class universities, senior executives from globally and nationally renowned companies, as well as recipients of the prestigious National Science and Technology Progress Award.

WLO Closed-loop R&D + Mass Production Platform

Since its establishment in 2017, NOP has built state-of-the-art facilities, including nearly 10,000 square meters of ultra-cleanrooms and cutting-edge hardware platforms. The NOP Shanghai R&D and Manufacturing Center features fully equipped office spaces, research labs, and in-house Class 100 and 1000 clean rooms.



NOP has also developed advanced quality control and software systems, along with comprehensive team training programs. This has enabled the realization of a fully integrated IDM system, covering the entire process from R&D, design, process development, mass production to quality testing.

Having undergone rigorous factory inspections and quality control certifications from top-tier multinational clients, the company has become one of the few globally to achieve shipments exceeding 10KK levels in the wafer-level optics field.



Intellectual Property

NOP has formed a competitive and holistic IP system, with hundreds of patents in portfolio.

Patent Applications:
370+

China Patents: 300+

US Patents: 11

PCT Patent: 16

GB/T29490 -2013



Qualifications

NOP holds the qualifications for mass production in the consumer electronics and automotive industries:

ISO 9001

ISO 14001

ISO 45001

IATF 16949



Three Key Product Lines

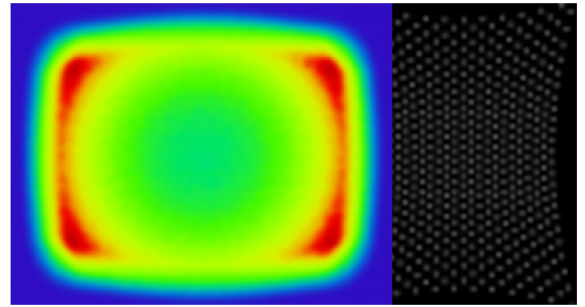
NOP has built three key product lines: sensing and machine vision, AR diffractive waveguide, and automotive LIDAR, all successfully adopted by leading clients around the globe.



Sensing and Machine Vision

Application: 3D Depth Sensing & Automatic Driving

- The core DOE of 3D depth imaging module must be designed using wafer-level processing and manufactured accordingly;
- LiDAR for autonomous driving and depth cameras.



AR Diffractive Waveguide

Application: AR Diffractive Waveguide

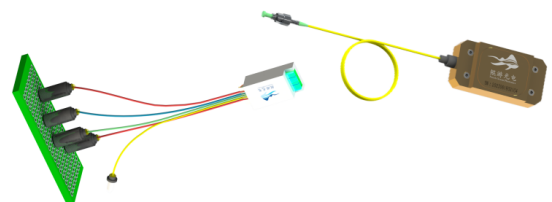
- The AR industry has tremendous potential, with the waveguide being the key display element in AR hardware with a high technical threshold.
- NOP can provide comprehensive solutions for AR waveguides that integrate multiple innovative approaches and enable cost-effective mass delivery.



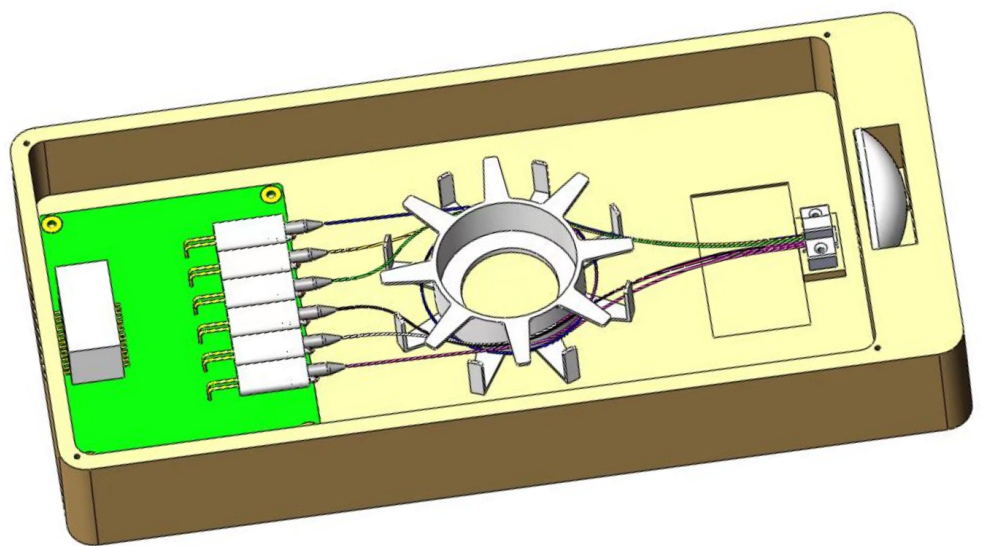
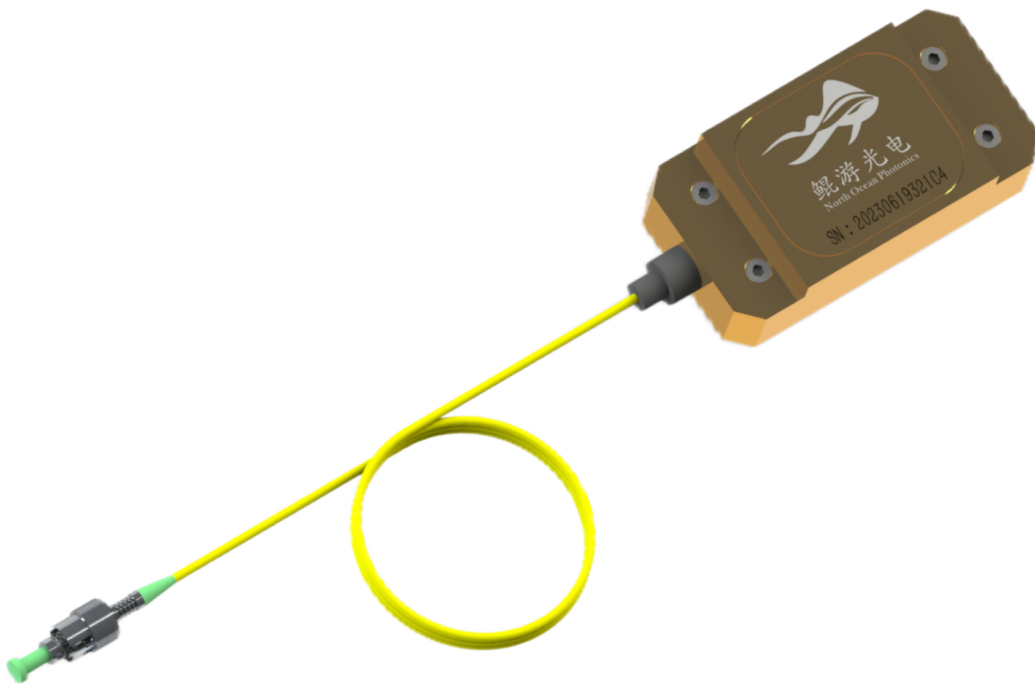
Automotive and LIDAR

Application: Fiber Optics and LIDAR

- Mainly used for high-speed (>100G) optical communication transceiver modules and high-precision coupling connections for silicon photonic chips;
- Optical transceiver module products for vehicle-mounted LiDAR, officially began to be integrated into mass production models of a well-known international brand at the beginning of 2022.



Automotive and LIDAR

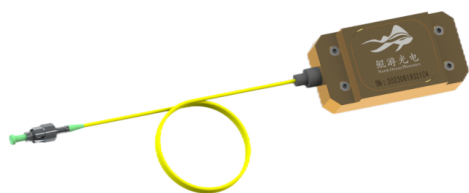


Product Portfolio

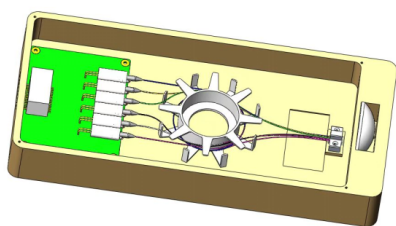
Applications	Product Category	Operating Wavelength	Channel	Insertion Loss		Uniformity	PDL	Operating Temperature	Storage Temperature	Connector Type
		nm		dB		dB	dB	°C	°C	
Automotive LiDAR Module	TX Transmitter Optical Module	1520~1560	4	≤ 7.0		≤ 1.0	≤ 0.3	-40~105	-40~125	
	RX Receiver Optical Module	1520~1550	6	≤ 0.5		≤ 0.25	≤ 0.3	-40~105	-40~125	LC/PC
Data Center Transmission Cable	LC Pre-terminated Fan-out Fiber	1310/1550	12/24	MPO/MTP	Fan-out					
				0.35~0.75	≤ 0.20	≤ 0.5	≤ 0.5	-20~70	-40~85	MPO/MTP-LC (SC) /PC
				0.35~0.6	≤ 0.30	≤ 0.5	≤ 0.5	-20~70	-40~85	MPO/MTP-LC (SC) /PC
				0.35~0.75	≤ 0.30	≤ 0.5	≤ 0.5	-20~70	-40~85	MPO/MTP-LC (SC) /APC
				0.35~0.6	≤ 0.30	≤ 0.5	≤ 0.5	-20~70	-40~85	MPO/MTP-LC (SC) /APC
High-speed Silicon Photonics Chip Module	DeMux AWG	CH0: 1271 $\pm$ 1	4	≤ 1.8		≤ 1.0	≤ 0.5	-5~85	-40~85	LC/PC
		CH1: 1291 $\pm$ 1								
		CH2: 1311 $\pm$ 1								
		CH3: 1331 $\pm$ 1								
	Mux AWG	CH0: 1271 $\pm$ 1	4	≤ 2.6		≤ 1.0	≤ 0.5	-5~85	-40~85	LC/PC
		CH1: 1291 $\pm$ 1								
		CH2: 1311 $\pm$ 1								
		CH3: 1331 $\pm$ 1								
High-power Laser	Fiber Optic Packaging Module	1310/1550	16/24/32/48/64/96/128					-5~70	-40~85	SC,FC,ST,SM A-905

■ Automotive LiDAR Module

Automotive LiDAR module products include TX transmitter fiber optical modules, RX receiver fiber optical modules, and automotive high-reliability fiber optic cables. NOP offers various packaging solutions and has large-scale manufacturing capabilities for automotive-grade LiDAR production. The related modules have shipped over 500,000 units.



TX Transmitter Optical Module(Solution 1)



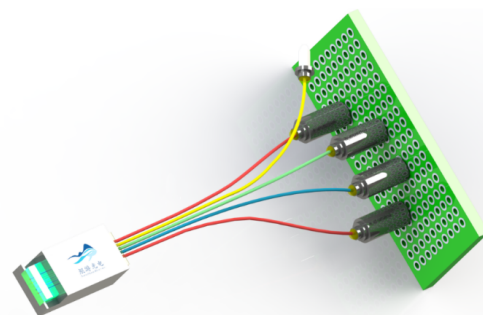
TX Transmitter Optical Module(Solution 2)

TX Transmitter Optical Module

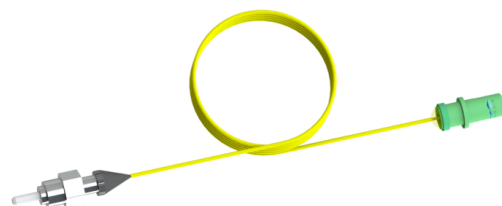
Parameter	Unit	Min.	Typ.	Max
Operation Wavelength	nm	1520	1540	1560
Channel Vertical Offset	mrad			0.5
Channel Horizontal Offset	mrad			0.5
Insertion Loss	dB			7
Max Polarization Dependent Loss	dB			0.3
Return Loss	dB	48		
Fiber Tensile Load	N			5
Operating Temperature	°C	-40		105
Storage Temperature	°C	-40		125

RX Receiver Optical Module

Specification	Unit	Min.	Typ.	Max.
Insertion Loss	dB			0.5
Operation Wavelength	nm	1520	1535	1550
Storage Temperature	°C	-40	-	125
Operating Temperature	°C	-40	-	105
Surface Scratch/Dig	S/D			40/20



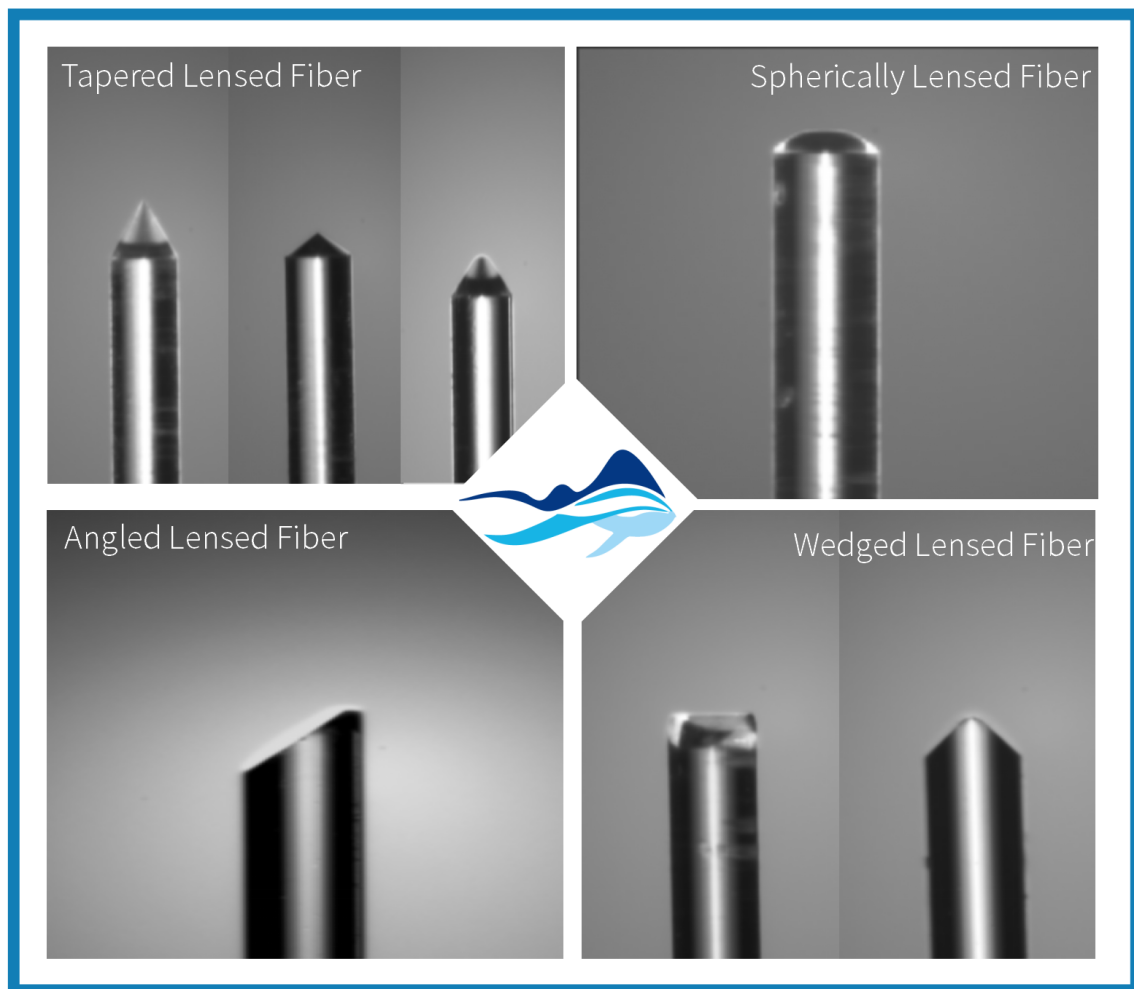
RX Receiver Optical Module



Automotive High-reliability Fiber Optic Cables

■ Lensed Fiber

Lensed fiber are lenses that are shaped at the end face of the fiber. The purpose of a fiber optic lens is to alter the light path or to perform mode conversion in fiber optic or optical systems. Fiber optic lenses have different requirements depending on the application field. Typically, the shapes of fiber optic lenses include conical, wedge-shaped, inclined, spherical, and others.



Product Features:

- High coupling efficiency
- Metalization
- Multiple spots
- AR coating

■ Lensed Fiber

Product Name	Taper / Bevel Angle (θ)	Radius (R)	Stripping Length
Tapered Lensed Fiber	50°- 140° ($\pm 1^\circ$)	3 μ m - 20 μ m $\pm 1\mu$ m	± 1 mm
Spherically Lensed Fiber	/	>50 μ m $\pm 1\mu$ m	± 1 mm
Angled Lensed Fiber	30°- 140° ($\pm 1^\circ$)	/	± 1 mm
Wedged Lensed Fiber	30°- 140° ($\pm 1^\circ$)	3 μ m - 20 μ m $\pm 1\mu$ m	± 1 mm

➤ Highly Customized

Depending on market and customer requirements, single- mode/multi-mode fibers can be utilized. Fiber length and coating length can be customized to meet requirements for spot size and coupling efficiency.

➤ Processing of Bare Fibers

We have capability for processing of bare fibers, without using any adhesives, ensuring no organic residue.

➤ AR Coating

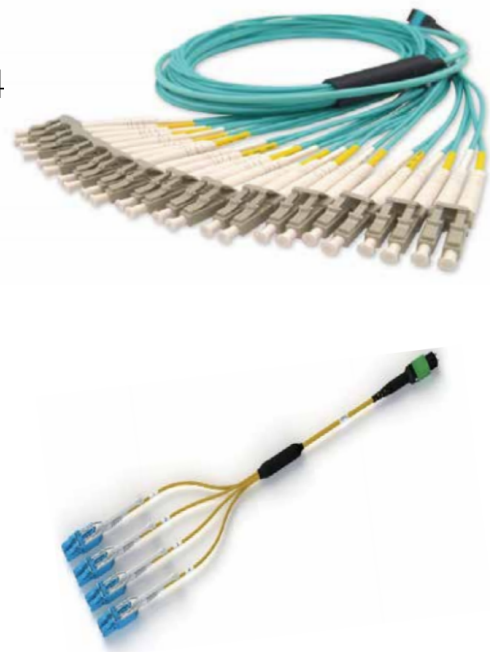
Depending on market and customer requirements, AR (anti-reflection) coating can be applied to lensed fiber, including 980nm, 1310nm, 1480nm, 1550nm, or as specified by the customer, with transmittance of $T \geq 99.7\%$.

➤ High-precision Process

Utilizing self-developed equipment to control various parameters of the fiber end-face.

■ Data Center Transmission Cable

MPO-LC/SC pre-terminated fan-out fiber refers to a fiber optic cable with an MPO single-head connector (12 or 24 cores) at one end, and an LC/SC connector at the other end. This product is mainly used in pre-terminated module boxes to connect the main trunk fiber cables to the equipment jumpers, making the system modular and achieving plug-and-play functionality. Compared to traditional splicing, it greatly improves work convenience and efficiency.



➤ Key Parameters

Parameters		Min	Standard	Max	Unit
Operating Wavelength	Single- mode	1310/1550			nm
	Multi-mode	1310/1550			
Insertion Loss (MPO/MTP)	Single- mode			0.75	dB
	Single-mode Low Loss			0.35	
	Multi-mode			0.60	
	Multi-mode Low Loss			0.35	
Insertion Loss (Fan-out)	Single- mode PC			0.20	
	Single- mode APC			0.30	
	Multi-mode			0.30	
Return Loss (MPO/MTP)	Single- mode	60			
Return Loss (Fan-out)	Single- mode PC	50			
	Single- mode APC	60			
Operating Temperature		-20		70	°C

■ High-power Laser

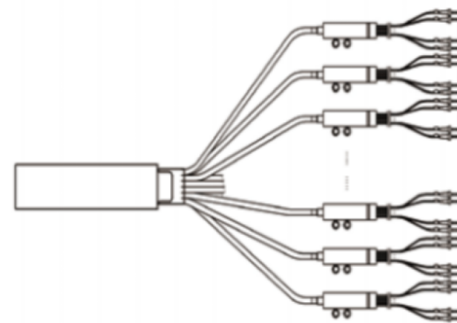
NOP offers full-channel CH16~CH128 and full-size two-dimensional fiber optic packaging module products. We also provide customized services based on customer design requirements.

Product Features

- High Reliability
- Micro Packaging
- Higher Laser Transmission Power
- Customizable



01 Circular packaging



02 Square packaging

➤ Key Parameters

Parameters	Unit	NOP-16/24/32/48/64/96/128	NOP-24/30/32/6
Channel	ch	16/24/32/48/64/96/128	24/30/32/64
X/Y Deviation	μm	≤±1	
Fiber Layers	--	1D/2D/3D/4D	
Coupling Efficiency	--	>90%	
Fiber Core Diameter	μm	9/50/60/105/Customizable	
Fiber Cladding Size	μm	80/125	
Fiber Outer Cladding Size	μm	250	
Outer Tube Size	μm	900	
Fiber Length	m	0.8/1.0/1.5/3/Customizable	
Connector Type	--	SC,FC,ST,SMA-905/Customizable	
Module Packaging Structure	Square Metal Module Box/Metal Circular Box /Customizable		

■ High-speed Silicon Photonics Chip Module

Product Features:



- Thin cover glass process
- Micro Packaging
- Customizable
- Ultra-low Loss
- High Reliability



01 DeMux AWG

➤ Key Parameters

Parameters		Unit	Value	Notes
Channel Pitch		μm	250	
Chip Size		mm	9.6X1.6X1	L*W*H
Channel Interval		nm	20	ITU-T694.2
Central Wavelength	CH0	nm	1271	
	CH1	nm	1291	
	CH2	nm	1311	
	CH3	nm	1331	
Central Wavelength Tolerance		nm	±1	Room Temperature
Central Wavelength Deviation		nm/°C	0.011	
Insertion Loss(Max)		dB	1.8	Including Fiber Coupling Loss
Loss Uniformity		dB	1	
Bandwidth (Min)	1dB	nm	12	
	3dB	nm	15	
Adjacent Channel Isolation(Min)		dB	21	
Non-adjacent Channel Isolation(Min)		dB	27	

■ High-speed Silicon Photonics Chip Module

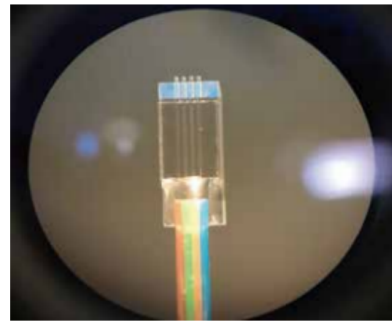
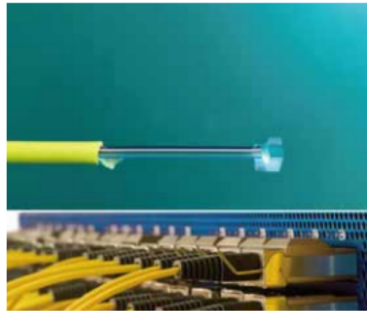
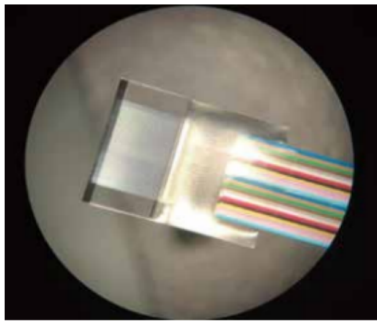


02 Mux AWG

➤ Key Parameters

Parameters		Unit	Value	Notes
Channel Pitch		μm	500	
Chip Size		mm	6.8X2.3X1.6	L*W*H
Channel Interval		nm	20	ITU-T694.2
Central Wavelength	CH0	nm	1271	
	CH1	nm	1291	
	CH2	nm	1311	
	CH3	nm	1331	
Central Wavelength Tolerance		nm	±1	Room Temperature
Central Wavelength Deviation		nm/°C	0.011	
Insertion Loss(Max)		dB	2.6	Including Fiber Coupling Loss
Loss Uniformity		dB	0.5	
Bandwidth (Min)	1dB	nm	10	
	3dB	nm	14	
Adjacent Channel Isolation(Min)		dB	/	
Non-adjacent Channel Isolation(Min)		dB	/	

■ High-density Chip Interconnection Module



Product Features:



- 1D/2D Density
- Coverless Process
- High Reliability
- High Precision Polishing Angle and Surface Finish
- Customizable

➤ Key Parameters

Parameters	Unit	Value
Material	--	Quartz/Borosilicate Glass
Channel	ch	1~128
Distance	μm	127/250/500/Customizable
Polishing Angle	°	0/8/12.5/45/Customizable
Fiber Spec	--	G657 A1, A2, B3
Length Tolerance	mm	0.5
Operating Temperature	°C	-5 ~70
Storage Temperature	°C	- 45 ~85

■ High-channel Arrayed Waveguide Grating

Product Features:



- High Reliability
- Ultra-low Crosstalk
- High Isolation
- Customizable

➤ Key Parameters

Parameters		Spec		
Channel		Min	Typ	Max
			40	
Channel Interval(GHz)			100	
Central Wavelength(nm)			C-Band	
Clear Channel Bandwidth(nm)			± 0.1	
Wavelength Stability(nm)			± 0.05	
1dB Channel Bandwidth(nm)		0.4		
3dB Channel Bandwidth(nm)		0.6		
Optical Loss in ITU Network(dB)			4.5	6.0
Isolation(dB)	Adjacent	25		
	Non-adjacent	30		
	Total	22		
Insertion Loss Uniformity(dB)			1.0	1.5
Directionality (multiplexing only)(dB)		40		
Insertion Loss Flatness(dB)				0.5
Polarization Dependent Loss (in the clear channel bandwidth)(dB)			0.3	0.5
PMD(ps)				0.5
Maximum Optical Power(mW)				23
Mux/Demux/Input/Output Detection Range(dB/°C)		-35		+23
Operating Temperature(°C)		-5	+25	+65
Operating Humidity(%RH)		5		95
Storage Temperature(°C)		-40		+85
Storage Humidity(°C)		5		95
Return Loss(dB)		40		
Packaging Size(mm)		L150XW65XH16		



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