

# Photonics Convergence Industry Classification Table

Classification	Main Category	Sub Category	Product Type	
Optical ICT	Optical Connection Component	Optical Element	( <b>Communication Light Emitting Element</b> ) 5xx ~ 15xx nm Light Emitting element (LED, LD, VCSEL, DFB-LD, ML-LD, Si-PD, Ge-PD, InGaAs-PD, APD), SiP-OIC ( <b>Passive Component</b> ) isolator, circulator, NxN distributor, connector, coupler, attenuator, wavelength separator, MPO, fiber optic grid, wavelength filter, multiple core separator ( <b>Active Component</b> ) TOSA, ROSA, BOSA, variable wavelength laser, tunable receiver, SOA, modulator, switch device, graphene optical element	
		Optical Module	( <b>Active Device</b> ) transceiver(transponder, transmitter, receiver, wavelength tunable), modulator, repeater(amplifier, repeater), time/wavelength/spatial multiplexer, switch, OXC, optical fiber splicer	
		Optical Fiber	( <b>Passive Device</b> ) distribution device(distribution panel, subscriber distribution device for PON) wavelength division device (WDM multi-channel multi/reverse multiple device) ( <b>Communication Optical Fiber</b> ) SMF, MMF, DCF, EDF, multi-core optical fiber, multi-mode optical fiber, polarization-maintaining optical fiber(elliptical core, bow-tie), special optical fiber ( <b>Optical Cable</b> ) photoelectric composite cable, indoor/outdoor cable, FTTH cable, special optical cable	
	Optical Connection System	Backbone/ Distribution Network System	( <b>Subnet transmission</b> ) WDM transmission device (WDM multi-channel transmission), TDM transmission device (SDH, PDH, ATM) ( <b>Distribution network transmission</b> ) PON, optical LAN, optical router, CATV, optical relay device for mobile communication	
		Mobile Network System	FSO(Free Space Optical communication), 4G/5G RAN	
		Personal Network System	Optical Camera Communication(visible optical communication, Li-Fi, LED ID, etc.)	
		Optical Information Security System	Quantum Optical Communication	
	Lighting	General Lighting	Interior Lighting	Commercial / residential / public lighting (ballast built-in type, ballast exterior type, down light, flat type luminaire, mobile luminaire, etc.)
			Exterior Lighting	- <b>Road Lighting</b> (street light / security light, tunnel light) - <b>Landscape Lighting</b> (flood lights, decorative lights, underwater lights)
			Special Lighting	Traffic signal lights, explosion-proof lights, factory lights, emergency induction lights, crime prevention lights, fire fighting lights, military lights, stage broadcasting lights, etc.
Convergence Lighting		Smart Lighting	- <b>Energy Convergence Lighting</b> (grid connection and PoE lighting, natural / artificial light convergence lighting, zero energy convergence lighting) - <b>IoT Convergence Lighting</b> (smart home / city linked IoT lighting, lighting communication system, etc.) - <b>Human-centered Lighting</b> (light therapy lighting, visual / visible fusion emotional lighting, safety / disaster prevention lighting) - <b>OLED Lighting</b> (large area OLED lighting)	
		Consumer Electronics Lighting	( <b>Mobile Phone</b> ) Mobile terminal (keypad, indicator, flash lighting) ( <b>Household Appliances</b> ) Refrigerators, washing machines, air conditioners, displays for display (electronic appliances), beam projectors, etc.	
		Transportation Lighting	Automotive, marine, railroad, aviation, and other transportation equipment	
	Agriculture & Marine Lighting	Environmental pollution control lighting, aquaculture lighting, ship and underwater / fishing lighting, route sign lighting, port dock lighting, agricultural lighting (plant cultivation, seedling, flower, etc.), plant lighting, etc.		

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Medical & Bio	Medical	Diagnostic	Blood Sugar Diagnosis, Blood Pressure Diagnosis, Blood Flow Diagnosis, Laparoscopic, Optometry, Image Diagnosis, Fluorescence Analyzer, In Vitro Diagnosis, Contrastography, Bone Density Meter
		Treatment & Surgery	Dental, surgical, skin treatment, skin beauty, ophthalmology, linear accelerator
	Bio	Sterilization Catalyst	UV sterilization / purification equipment, photocatalyst, UV photoreaction equipment
		Environment	Fine dust air quality measurement and purification equipment, water quality measurement and purification equipment
		Beauty	Hair growth promoting machine, wrinkle improvement device, tanning device, etc.
Precision	Inspection Measurement	Sensor	Distance, temperature, speed, vibration, pressure, wavefront, on-off, micro displacement, deformation, environment, acoustic, bio, gas, current / voltage optical sensor device, lidar, distributed sensor, etc.
		Measurement	OTDR, OSA, shape meter, optical loss meter, power meter, laser spectrometer, particle counter
	Laser	Industrial Laser	Equipment for foundry (cutting, welding, drilling, marking, heat treatment, cleaning), semiconductor equipment (lithography, defect analysis), leisure & display equipment (home theater, portable projector, outdoor advertising), defense equipment, laser equipment (gas laser, solid state laser, fiber laser, CW / pulse laser, hybrid laser, femtosecond laser)
Material & Component	Material	Amorphous Material	Oxide optical glass, non-oxide infrared optical glass, active laser glass, synthetic quartz, display glass (tempered glass), photoelectric amorphous thin film
		Crystalline Mineral Material	Magnetic optical crystals (YIG, BIG, YVO, Er: YVO), electro-optical crystals (LiNbO3, LiTaO3), laser crystals (Nd: YAG, Er / Yb: YAG), plasmonic nanomaterials (nanoparticles, nano-rods), ZnSe, Ge, ZnS, MgF2, phosphor, polycrystalline / monocrystalline silicon ingot / wafer
		Organic Mineral Material	Thermoplastic resin, thermosetting resin, optical film material (PI, PET, PP, EVA Sheet, etc.), Photo Resistor (photosensitive material), organic light-emitting body, quantum dot
	Component	Non-communication Optical Fiber	Large diameter fiber, bundled fiber, plastic fiber, attenuator fiber, high power fiber, sensor fiber, sensor special fiber
		Optical Lens	Aspheric plastic lens, glass lens (spherical / aspherical), micro array lens, infrared lens, wafer level lens, liquid lens, contact lens, free-form lens (for AR / VR, HUD / HMD, future car, lighting), Ball Lens, prism, reflector, beam splitter, mirror, window, polarizer, diffraction grating
		LED Device	- LED substrate - Chip (Red LED chip, Blue LED chip, Green LED chip, UV LED chip, D-UV LED chip, IR LED chip, RC LED chip, Multi-wavelength LED chip, Micro LED chip, etc.) - Package (S / V, T / V, lamp, SMD, High power, RGB 3 in 1, TO, WLP, COB, Multi-chip, Micro, Mini, Filament PKG, Microcapsule LED, Chip Scale Package, etc.) - Module (engine)
		Laser Device	LD Chip, High Power Laser Diode, Beam Combiner, Beam Isolator, Beam Collimator, Laser Beam Delivery, Beam Homogenizer, Beam Shaping Head, Laser Processing Head, Laser Mount

Classification	Main Category	Sub Category	Product Type
Video & Information	Video Indicator	LCD	TFT-LCD (TV, monitor, laptop, mobile, etc.), LCD Auto display, LCD Curved display, Automotive LCD display, PID (public information display)
		OLED	Flexible OLED Display (mobile / wearable), Flexible Display, Small AMOLED (mobile), Large AMOLED (TV), 8K OLED TV, OLED Curved TV, Transparent OLED Display, Rollable OLED Display
		QD · LED	QDLED, micro LED display, media facade, public display, etc.
		Others	Display board, sign panel and sign, digital signage, etc.
	Information Input/Output Device	I/O Device	Projection keyboard, touch screen panel (TSP), optical mouse, Blu-ray player, DVD R/W, CD-ROM driver, barcode reader, scanner (2D/3D), printer, copier
Information Storage		Optical disc, spatial light modulator (SLM), holographic memory, DVD, blue-ray player	
Optical Equipment	Movable	Wearable Device	Action Cam, Camera for Mobile Phone, Digital Camera, HMD (AR/VR, Smart Glass)
		Driving Device	Lidar system, black box cam, autonomous driving camera, drone camera, HUD, safety camera
	Stationary	Residential/Life	CCTV, household appliances camera (IP camera, cleaning camera, etc.), home security optics (iris, fingerprint, face recognition), beam projector, portable projector
		Industrial	Infrared camera, microscope, telescope, binoculars, endoscope
Energy	Solar Device	Solar Cell	<Solar cell by generation> - 1st generation: monocrystalline / polycrystalline silicon solar cell - 2nd generation: silicon thin film, CIS system, high efficiency cell, CdTe system, $\mu$ c-Si, heterojunction (HIT) - 3rd and 4th generation: DSSC, organic thin film, non-vacuum CIGS thin film solar cell, quantum dot solar cell, condensed PV ultra high efficiency solar cell, ultra-long life solar cell, radiation resistant solar cell, space-mounted solar cell, nanostructured solar cell
		Solar Module	Solar module (crystalline, thin film, BIPV, BAPV, VIPV, DIPV, condensing type, etc.)
	Solar Power System	Energy Conversion Inverter	Module Integrated Converter, Individual Inverter
		Energy Storage ESS	Solar storage ESS (lithium battery, VRFB, lead acid battery, Pb, etc.)
		Energy Generation System	Standalone system (energy independent solar power plant), grid connection system (farming type, roof type, salt type, water type, window type solar power plant, etc.)
Hydrogen and Electric Energy		Hydrogen, fuel cell (PEMFC, SOFC, MCFC, DMFC, AFC, PAFC), electrolytic catalyst	

※ Definition of Photonics Convergence Industry: An industry that creates new technological and market values through convergence with other industries (major and new business) by advancing photonics technologies such as LED, laser, and light sensor

※ Eight Photonics Convergence Industry Criteria: Classified the categories according to the purpose and application of the photonics convergence industry