MITSUBISHI
ELECTRIC

Changes for the Better

OPTICAL DEVICES

OPTICAL DEVICES

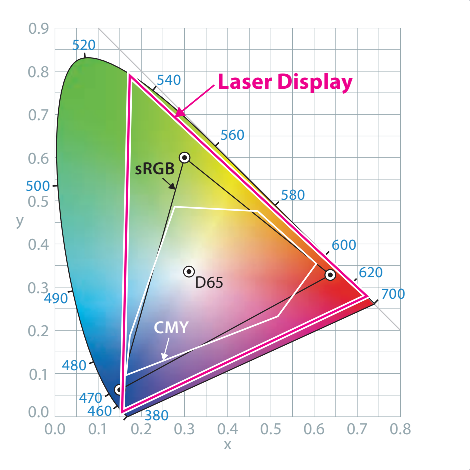
Mitsubishi Electric Optical Devices:
The Key to Connecting Information Networks in the Future.

LASER DIODES FOR PROJECTORS

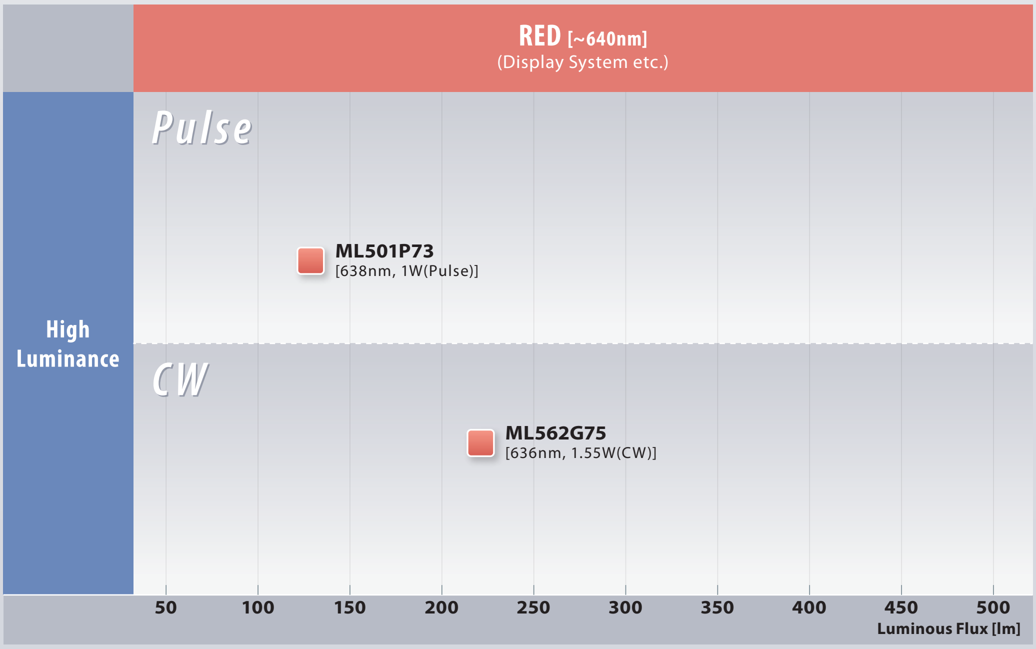
Please visit our website for further details

638nm High-output Laser Diode for Projectors

Compared to LEDs, semiconductor lasers have lower power consumption, higher output and can be used with optical systems having a higher maximum aperture. These considerable advantages mean that they can be used for projectors that do not require focal adjustment. Mitsubishi Electric has a range of lasers available, including a multi-mode semiconductor laser with a wavelength below 640nm and 1W output (when pulse-driven), 1.55W output (when CW-driven) that provides highly visible, vibrant red colors for color projectors.



Selection map of Red Laser Diodes



ML501P73
Cap less

ML562G75
Flat glass cap

Line-up of Laser Diodes [Multi Transverse mode LD]

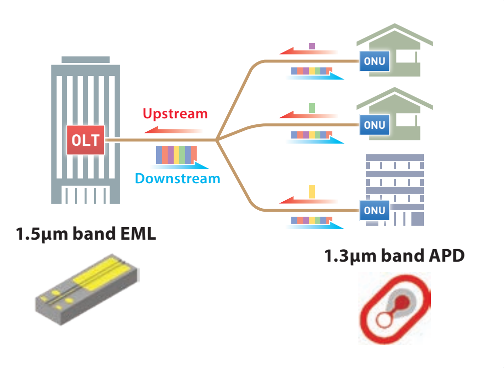
Type Number	Application	Wavelength [nm]	Output Power @CW [mW]	Output Power @Pulse [mW]	Case Temperature [°C]	Package
ML501P73	Display	638	500	1000	40	ϕ5.6mm TO Capless
ML562G75	Display	636	1550	–	35	ϕ9.0mm TO Flat glass cap

OPTICAL DEVICES FOR OPTICAL COMMUNICATION SYSTEMS

Please visit our website for further details »

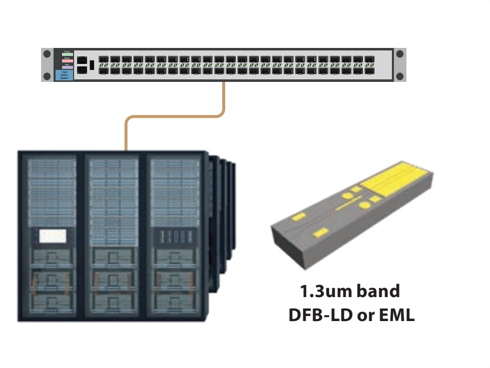
Optical Devices for Fiber-to-the-Home (FTTH)

As streaming music and video becomes a common service, there is growing interest in Fiber-to-the-Home (FTTH), an optical communication system that provides high-speed, stable bandwidths to each household. The adoption of faster communication technologies such as 10G-EPON and XG-PON is progressing. Anticipating the future, field trials for 50G-PON—an even faster method of connectivity—are also underway, and we will meet our customers' needs with a product lineup that supports these advancements.



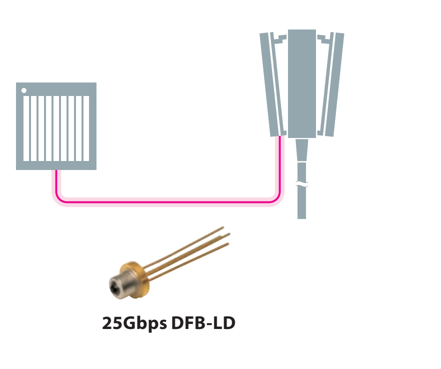
Optical Devices for Data Centers

Data centers have been expanding as a platform for storing and distributing digital contents such as SNS, photos, and videos on the ever-increasing Internet.
In recent years, with the shift from on-premise-type to cloud-type storage, and the expansion of various cloud computing services, data centers are expected to grow as a platform that provides the foundation and infrastructure for cloud computing services. For the data center market, which requires advanced technologies, Mitsubishi Electric provides high-speed, low-power optical devices that contribute as the result of the unique characteristics of compound semiconductors.



Optical Devices for 5G Mobile Base Stations

Fifth-generation (5G) mobile communication system will offer ultrahigh-speed communication, low latency, and ultra-multiple connections. Accordingly, 5G mobile communication system is expected to become used widely around the world. With the increase in communication traffic, optical devices that support mobile base station networks are also required to operate at higher speeds, over a wider temperature range, and have higher reliability. Mitsubishi Electric utilizes the industry-standard TO56 package to expand the connectivity of various products such as 25Gbps DFB. We are also developing 100Gbps EML CAN for the future as well as services that will support the application and market growth of 5G mobile base stations, and is ready to support the market growth of 5G mobile base station applications in the future.



Terminology

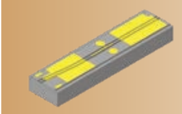
APD	Avalanche Photo Diode
BiDi	BiDirectional
CFP	Centum gigabit Form-factor Pluggable
CPRI	Common Public Radio Interface
CW	Continuous Wave
CWDM	Coarse Wavelength Division Multiplexing
Df	Focal Distance
DFB-LD	Distributed FeedBack Laser Diode
EML	Electro absorption Modulator integrated Laser diode
FP-LD	Fabry-Perot Laser Diode
FTTH	Fiber To The Home
G-PON	Gigabit Passive Optical Network
GE-PON	Gigabit Ethernet Passive Optical Network
HS-PON	High-Speed Passive Optical Network
ITLA	Integrable Tunable Laser Assembly
LED	Light Emitting Diode
OLT	Optical Line Terminal
ONU	Optical Network Unit
OSFP	Octal Small Form-factor Pluggable
OTDR	Optical Time Domain Reflectometer
P2P	Peer to Peer
PAM4	4-level pulse amplitude modulation
QSFP-DD	Quad Small Form-factor Pluggable Double Density
SDH	Synchronous Digital Hierarchy
SFP+	Small Form-factor Pluggable Plus
SNS	Social Networking Service
SONET	Synchronous Optical NETwork
TDM	Time Division Multiplexing
XFP	10 Gigabit small Form-factor Pluggable
10G-EPON	10 Gigabit Ethernet Passive Optical Network
XG-PON	10 Gigabit Passive Optical Network

Selection Map of OPTICAL DEVICES [**Under 50Gbps**]

		Bit Rate				
		~1.25Gbps	2.5Gbps	10Gbps	25Gbps	50Gbps
EML	1.3μm					**ML7CP76**** for 50G-PON Built-in SOA
	1.5μm			**ML9CP64*** for XG(S)-PON N2a OLT Combo-PON C+		
DFB-LD	1.3μm			**ML768K42T** for 10GBASE-LR **ML768LA42T** for CPRI	**ML771AA72T** **(25Gbps x 1λ)** for 25Gbps 10km TDM **ML771LA72T** **(25Gbps x 3λ)** for 25Gbps 15km TDM	**ML771AA74T** **(50Gbps PAM4 x1λ)** for 50Gbps 10km TDM **ML771LA74T** **(50Gbps PAM4 x 4λ)** for 50Gbps 15km TDM
	1.55μm	**ML920LA43S** for TDM (1.55μm) 8λ CWDM				
FP-LD For OTDR		**ML776H10** 1.3μm FP-LD **ML976H10** 1.55μm FP-LD				

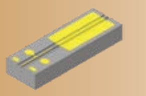
ML7CP76**

Bare die



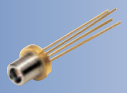
ML9CP64*

Bare die



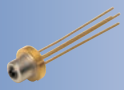
ML920LA43S
ML768LA42T
ML771LA72T
ML771LA74T

Aspherical lens cap

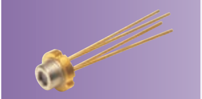


ML768K42T
ML771AA72T
ML771AA74T

Ball lens cap



ML776H10
ML976H10



★: New product ★★: Under development

Selection Map of OPTICAL DEVICES [**Over 100Gbps**]

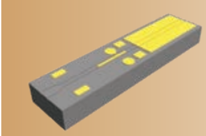
<table>
<tr><th></th><th></th><th colspan="4">Bit Rate</th></tr>
<tr><th></th><th></th><th>100Gbps</th><th>400Gbps</th><th>800Gbps</th><th>1.6Tbps</th></tr>
<tr><td rowspan="4">EML</td><td>1.3µm</td><td>ML775Axx**
(100Gbps PAM4 x1λ)
for 100G LR1</td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">CWDM</td><td colspan="3">ML7CP70
(100Gbps PAM4 x 4λ)
for 100G DR1/LR1,
400G DR4/FR4/LR4,
2x400G FR4,
800G DR8</td><td></td></tr>
<tr><td></td><td></td><td colspan="2">ML7CP73
(200Gbps PAM4 x 4λ)
for 800G DR4/FR4, 2x800G FR4,
1.6T DR8</td></tr>
<tr><td>LAN-WDM</td><td colspan="2">ML7CP75
(100Gbps PAM4)
400GHz space LAN-WDM x 4λ,
800GHz space LAN-WDM x 4λ
for 100G ER1 BiDi,
400G ER4</td><td></td><td></td></tr>
<tr><td>Tunable-LD</td><td>C-band, L-band</td><td colspan="3">ML9CP72**
nano-ITLA
for 800ZR/ZR+ and 1600ZR/ZR+</td><td></td></tr>
<tr><td>Narrow linewidth CW-LD</td><td>O-band</td><td colspan="4">ML7CP83**
for 800G/1.6T Coherent-Lite</td></tr>
</table>

ML775Axx**

Aspherical lens cap

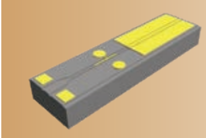
ML7CP70

Bare die



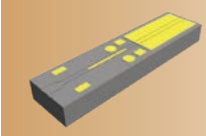
ML7CP73

Bare die



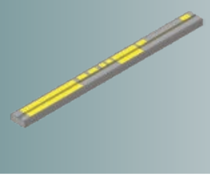
ML7CP75

Bare die



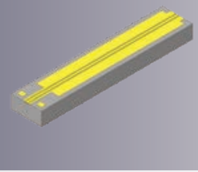
ML9CP72**

Bare die



ML7CP83**

Bare die



★★: Under development

Line Up of **LD/LD Modules [Under 50Gbps]**

	Type Number	Chip Type	Package	Wavelength [nm]	Case Temp. [°C]	Features
50G	**ML771AA74T**	DFB-LD	TO56-CAN	1310	-40~+90	50Gbps PAM4, 10km, Df=6.6mm
	ML771LA74T	DFB-LD	TO56-CAN	1270, 1290, 1310, 1330	-40~+90	Bidirectional, 50Gbps PAM4, 15km, Df=7.5mm
	ML7CP76★★**	EML	Bare die	1342	+45~+50	50G-PON, Built-in SOA
25G	**ML771AA72T**	DFB-LD	TO56-CAN	1310	-40~+90	25Gbps, SFP28, 10km, Df=6.6mm
	ML771LA72T	DFB-LD	TO56-CAN	1270, 1310, 1330	-40~+90	Bidirectional, 25Gbps, SFP28, 15km, Df=7.5mm
10G	**ML768K42T**	DFB-LD	TO56-CAN	1310	-40~+95	10GBASE-LR, SONET/SDH
	ML768LA42T	DFB-LD	TO56-CAN	1270, 1330	-40~+95	CPRI
	ML9CP64★	EML	Bare die	1577	+45~+50	XG(S)-PON N2a, OLT
2.5G	**ML920LA43S**	DFB-LD	TO56-CAN	1550	-20~+95	P2P
				1470~1610 8λ CWDM	-10~+85	8λ CWDM
For OTDR	**ML776H10**	FP-LD	TO56-CAN	1310	-40~+85	OTDR
	ML976H10	FP-LD	TO56-CAN	1550	-40~+85	OTDR

★: New product ★★: Under development

Line Up of **APD/PD**

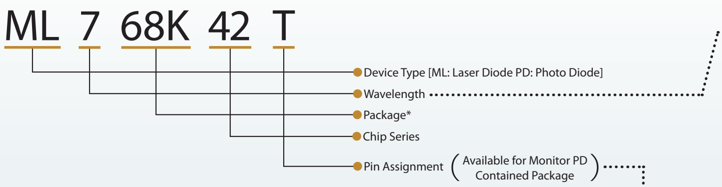
	Type Number	Chip Type	Package	Wavelength [nm]	Case Temp. [°C]	Features
10G	**PD8CP35**	APD	Bare die	1270~1577	-40~+95	10G-EPON/XG-PON, ONU & 40km

Line Up of **LD/LD Modules [Over 100Gbps]**

	Type Number	Chip Type	Package	Wavelength [nm]	Case Temp. [°C]	Features
800G/1.6T	**ML7CP73**	EML	Bare die	4λ CWDM	+50~+60	200Gbps PAM4, 800G DR4/FR4, 2x800G FR4, 1.6T DR8
	ML9CP72★★	DBR based Tunable-LD	Bare die	C-band and L-band	+45~+55	nano-ITLA for 800ZR/ZR+ and 1600ZR/ZR+
	ML7CP83★★	DFB-LD	Bare die	O-band	+45~+65	800G and 1.6T Coherent-Lite
400G	**ML7CP70**	EML	Bare die	4λ CWDM	+25~+75	100Gbps PAM4, 100G DR1/LR1, 400G DR4/FR4/LR4, 2x400G FR4, 800G DR8
100G	**ML7CP75**	EML	Bare die	4λ 400GHz LAN-WDM 4λ 800GHz LAN-WDM	+50~+60	100Gbps PAM4, 100G ER1 BiDi, 400G ER4
	ML775Axx★★	EML	TO56-CAN	1310	+45~+95	100Gbps PAM4, LR1

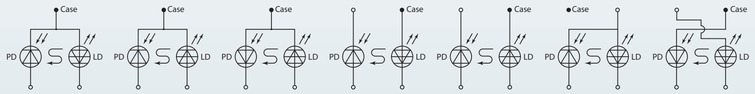
★★: Under development

Type Name Definition of Laser and Photo Diodes



Categories

Device Type	Wavelength	Wavelength Range (nm)
ML	5	500<λ≦700
	6	700<λ≦1000
	7	1250<λ≦1400
	9	1400<λ
PD	7 8	1000<λ≦1600



Type	N	C	R	F	E	S	T
LD	Anode Common	Cathode Common	Cathode Common	Anode Common	Cathode Common	Floating	Floating
PD	Cathode Common	Cathode Common	Anode Common	Floating	Floating	Floating	Anode Common

*Please contact our sales office about the selection packages.

MEMO

SAFETY CAUTIONS FOR USE OR DISPOSAL OF LISTED PRODUCTS

The warnings below apply to all products listed in this pamphlet.

	WARNING
Laser Beam	While the laser diode is on, its gives a laser beam. Even if we can't see a laser beam by its wavelengt, penetration into the eye by a laser beam or its reflected light may cause eye injury. Prevent the irradiating part or its reflected light from entering the eyes.
Injury	Fiber fragments may cause injury. In cases of fiber bending or breakage, never touch the fragment.
GaAs	Gallium arsenide (GaAs) is used in these products. To avoid danger, strictly observe the following cautions. • Never place the products in your mouth. • Never burn or break the products, or use any type of chemical treatment to reduce them to gas or powder. • When disposing of the products, always follow the laws which apply, as well as your own company's internal waste treatment regulations.
Disposal of Flame-Retarded Fiber Core Wire	Flame retardant resin must be disposed of according to law of industrial waste in disposal place. This product is a bromine type flame-retarded resin, containing bromine compounds and antimony trioxide. All disposal operations should be conducted with full consideration of this content.

Mitsubishi Electric Optical Devices Website

www.MitsubishiElectric.com/semiconductors/opt/

Keep safety first in your circuit designs!

- Mitsubishi Electric Corporation puts the maximum effort into making semiconductor products better and more reliable, but there is always the possibility that trouble may occur with them. Trouble with semiconductors may lead to personal injury, fire or property damage. Remember to give due consideration to safety when making your circuit designs, with appropriate measures such as (i) placement of substitutive, auxiliary circuits, (ii) use of non-flammable material or (iii) prevention against any malfunction or mishap.

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