MITSUBISHI ELECTRIC

Changes for the Better

OPTICAL DEVICES

OPTICAL DEVICES

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

Bit Rate

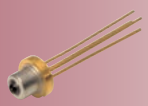
		~1.25Gbps	2.5Gbps	10Gbps	25Gbps	50Gbps
EML	1.3μm					**ML772B75** (50Gbps PAM4 x 2λ) for 50Gbps 40km BiDi **ML774E76**** for 50G-PON Built-in SOA
	1.55μm			**ML959B56** for 40km TDM		
	1.57μm			**ML959A64** for XG(S)-PON N2a OLT Combo-PON C+		
DFB-LD	1.3μm	**ML720T39S** for P2P		**ML768K42T** for 10GBASE-LR **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
	1.49μm	**ML920LA46S** for GE-PON OLT				
	1.55μm	**ML920LA43S** for TDM (1.55μm) 8λ CWDM				
FP-LD	1.3μm	**ML720K45S** for P2P **ML720Y49S** for GE-PON ONU	**ML720K19S** for P2P			
		For OTDR **ML776H10** 1.3μm FP-LD **ML976H10** 1.55μm FP-LD				

ML959B56
ML959A64
ML772B75
ML774E76**
Aspherical lens cap

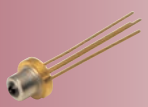
ML920LA46S
ML920LA43S
ML768LA42T
ML771LA72T
ML771LA74T
Aspherical lens cap

ML720T39S
ML768K42T
ML771AA72T
ML771AA74T
Ball lens cap

ML720K45S
ML720K19S



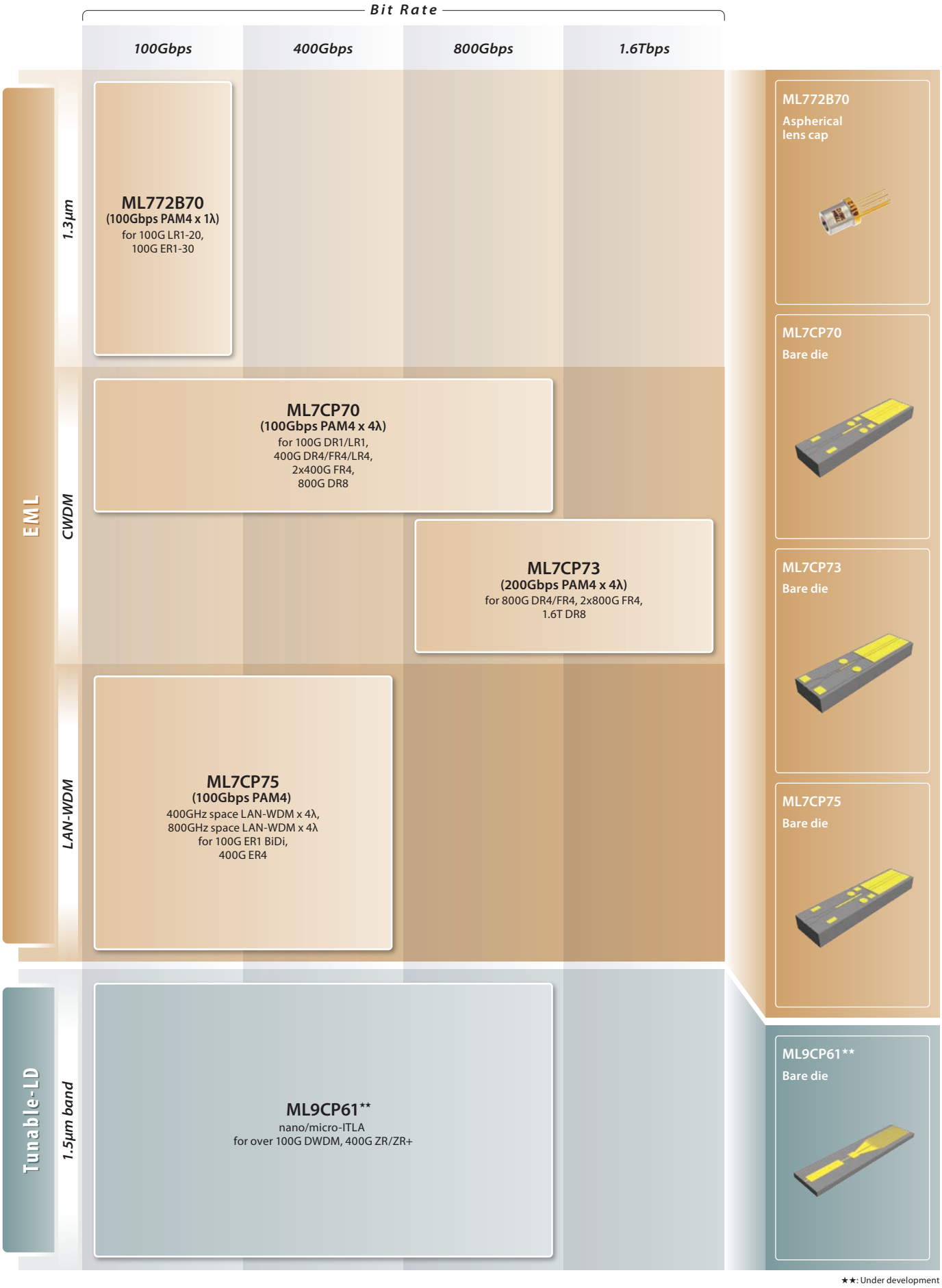
ML720Y49S



ML776H10
ML976H10

★★: Under development

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



★★: Under development

Mitsubishi Electric Optical Devices:

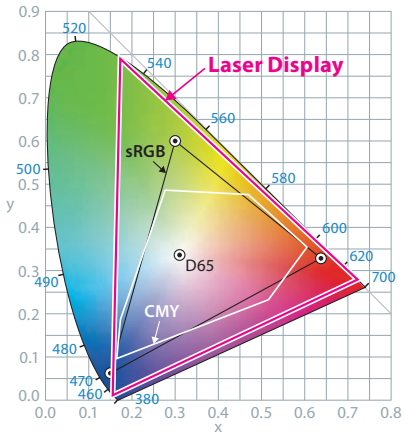
The Key to Connecting Information Networks in the Future.

LASER DIODES FOR PROJECTORS

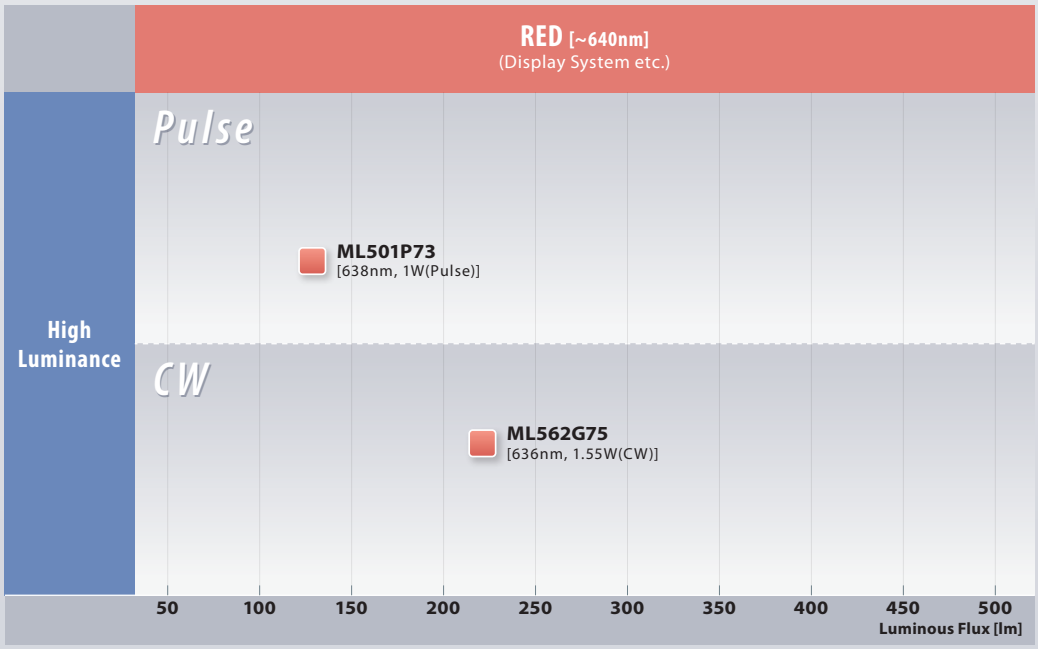
Please visit our website for further details

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 3.8W output (when pulse-driven), 2.1W 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]

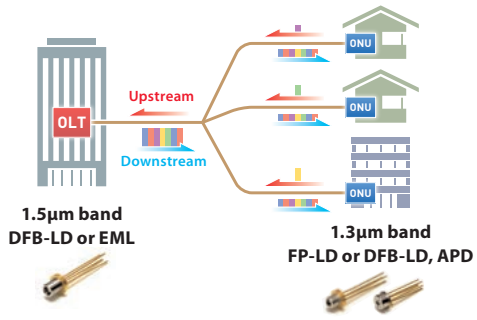
Type Number	Application	Wavelength [nm]	Output Power @CW [mW]	Output Power @Pulse [mW]	Case Temperature [°C]	Package
ML501P73	Display	638	500	1000	40	ϕ5.6mm TO Capless
ML562G75	Display	636	1550	–	35	ϕ9.0mm TO Flat glass cap

OPTICAL DEVICES FOR OPTICAL COMMUNICATION SYSTEMS

Please visit our website for further details

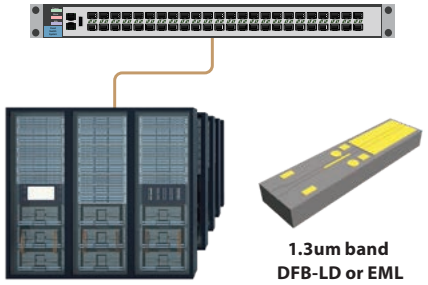
Optical Devices for Fiber-to-the-Home (FTTH)

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. Since approximately 2010, Mitsubishi Electric has contributed to FTTH by providing optical devices such as FP-LD, DFB-LD, EML and APD. Currently, 10G-EPON and XG-PON, which are faster communication systems, are being installed. For the future, the standardization of HS-PON as a next-generation FTTH system is also being discussed. Mitsubishi Electric maintains its lead in FTTH applications through its corresponding product lineup and new product development.



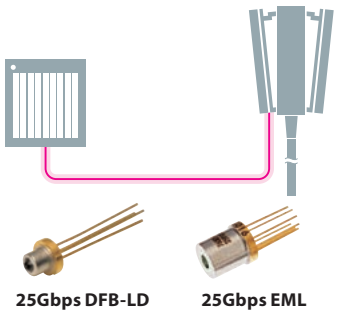
Optical Devices for Data Centers

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 and EML. 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

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

	Type Number	Chip Type	Package	Wavelength [nm]	Case Temp. [°C]	Features
50G	ML772B75	EML	TO56-CAN	1290, 1310	-40~+95	Bidirectional, 50Gbps PAM4, 40km
	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
	ML774E76**	EML	TO56-CAN	1342	-5~+80	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	ML959B56	EML	TO56-CAN	1550	-5~+80	XFP/SFP+, 40km
	ML959A64	EML	TO56-CAN	1577	-5~+80	XG(S)-PON N2a, OLT, Combo-PON C+
	ML768K42T	DFB-LD	TO56-CAN	1310	-40~+95	10GBASE-LR, SONET/SDH
	ML768LA42T	DFB-LD	TO56-CAN	1270, 1330	-40~+95	CPRI
2.5G	ML720T39S	DFB-LD	TO56-CAN	1310	-40~+95	P2P
	ML720K19S	FP-LD	TO56-CAN	1310	-40~+85	P2P
	ML920LA46S	DFB-LD	TO56-CAN	1490	-40~+85	G-PON OLT
	ML920LA43S	DFB-LD	TO56-CAN	1550	-20~+95	P2P
				1470~1610 8λ CWDM	-10~+85	8λ CWDM
1.25G/ ~622M	ML720K45S	FP-LD	TO56-CAN	1310	-40~+85	P2P
	ML720Y49S	FP-LD	TO56-CAN	1310	-40~+85	GE-PON ONU, High coupling efficiency
For OTDR	ML776H10	FP-LD	TO56-CAN	1310	-40~+85	OTDR
	ML976H10	FP-LD	TO56-CAN	1550	-40~+85	OTDR

★★: Under development

Line Up of **APD/PD**

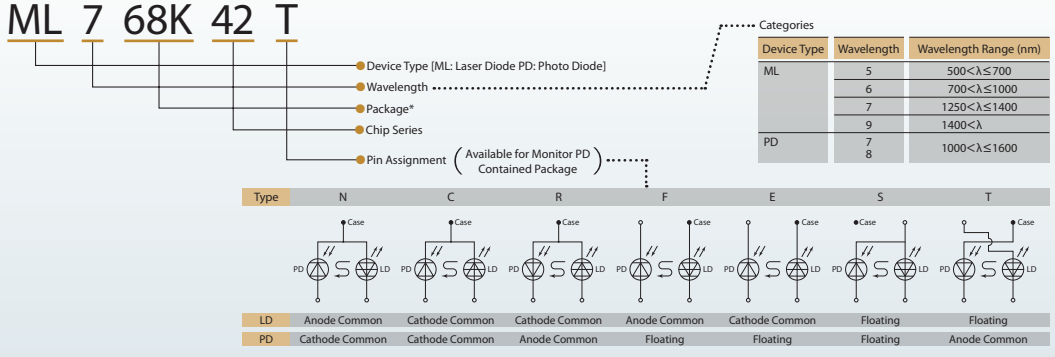
	Type Number	Chip Type	Package	Wavelength [nm]	Case Temp. [°C]	Features
10G	PD8CP35	APD	Bare die	1270~1577	-40~+95	10G-EPON/XG-PON, ONU & 40km

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
400G	ML7CP70	EML	Bare die	4λ CWDM	+25~+75	100Gbps PAM4, 100G DR1/LR1, 400G DR4/FR4/LR4, 2x400G FR4, 800G DR8
	ML9CP61**	Tunable- DFB array	Bare die	1527.994~1567.133	+28~+55	nano/micro-ITLA for over 100G DWDM, 400G ZR/ZR+
100G	ML7CP75	EML	Bare die	4λ 400GHz LAN-WDM 4λ 800GHz LAN-WDM	+50~+60	100Gbps PAM4, 100G ER1 BiDi, 400G ER4
	ML772B70	EML	TO56-CAN	1310	-40~+95	100Gbps PAM4, LR1-20
					-5~+80	100Gbps PAM4, ER1-30

★★: Under development

Type Name Definition of Laser and Photo Diodes



*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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