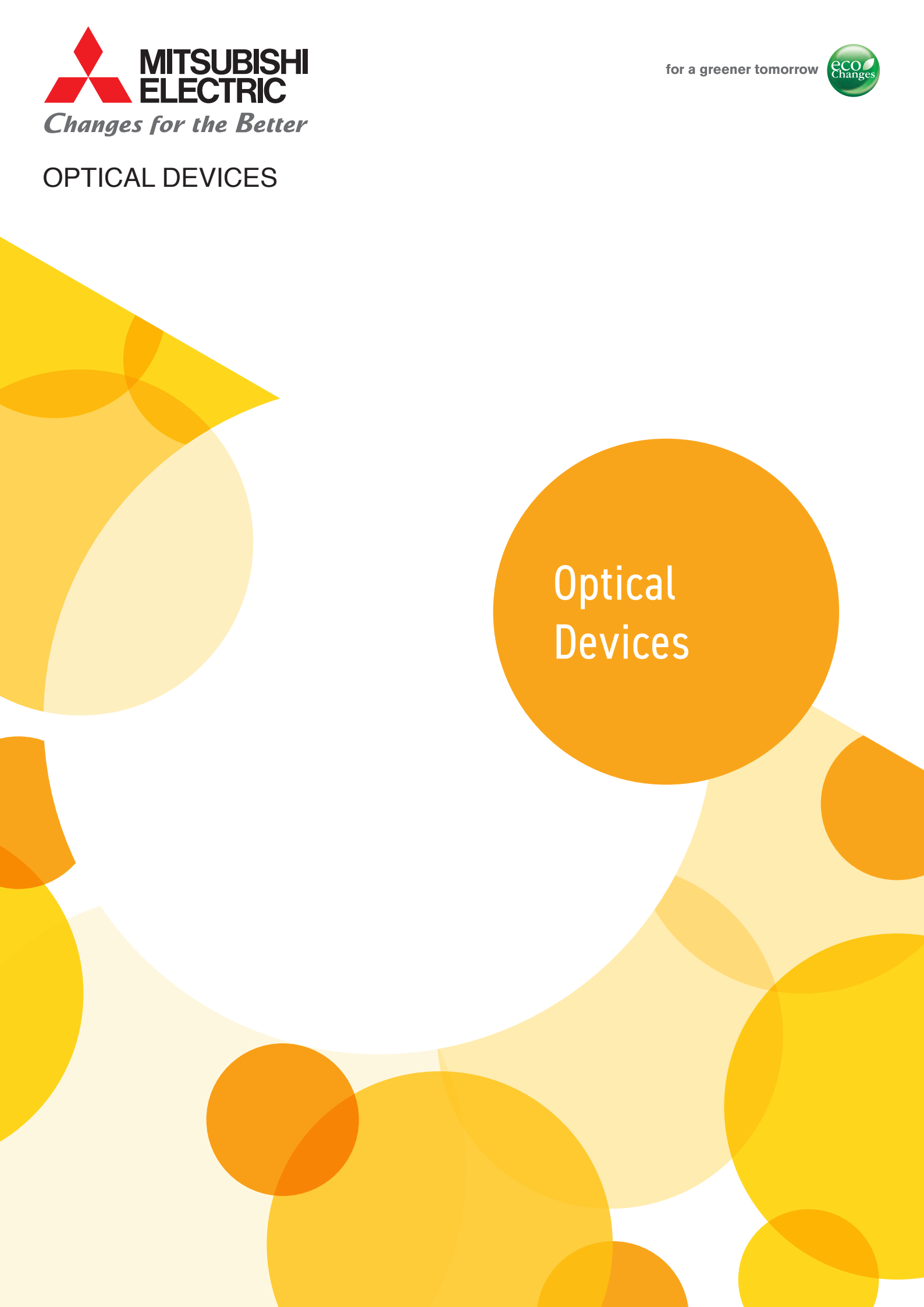


## OPTICAL DEVICES



Optical  
Devices

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

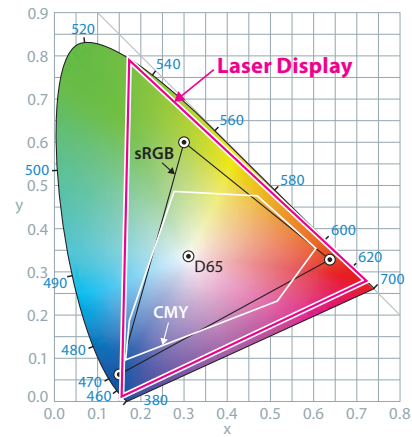
## LASER DIODES FOR INDUSTRY & DISPLAY

Please visit  
our website  
for further  
details.

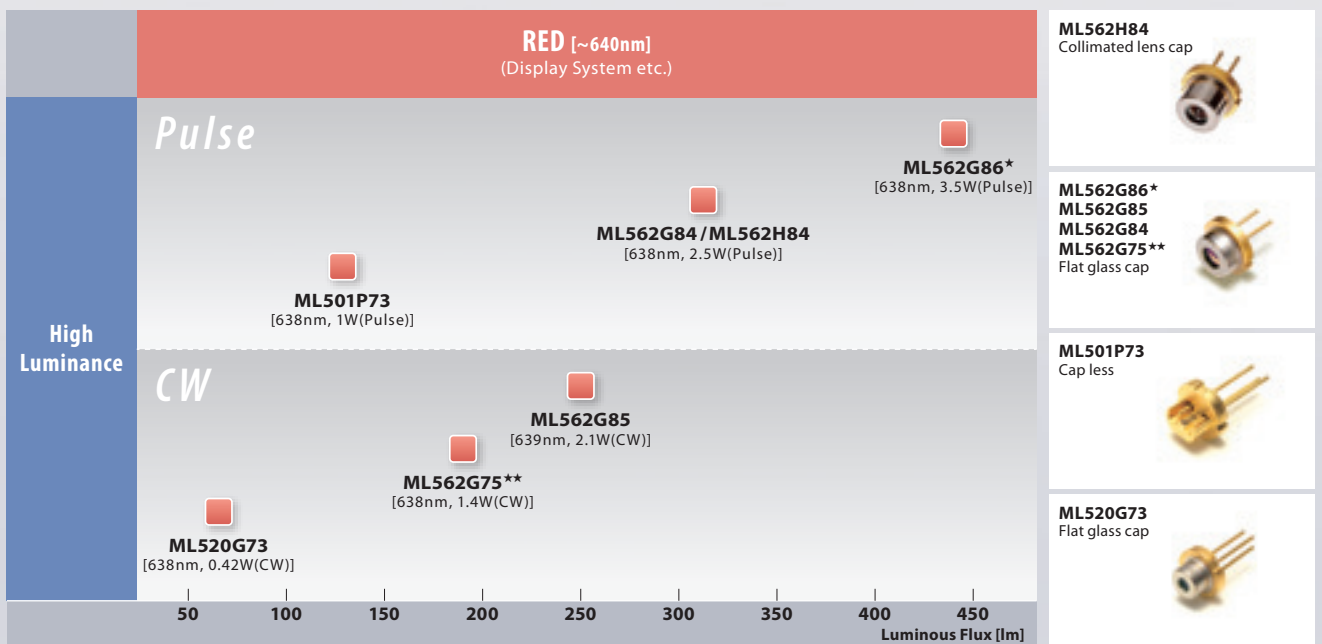


### 638nm High-output Laser Diode for Industry and Displays

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 3.5W 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



### 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
ML562G86*	Display	638	-	3500	45	φ9.0mm TO Flat glass cap
ML562G85	Display	639	2100	-	45	φ9.0mm TO Flat glass cap
ML562G84	Display	638	-	2500	45	φ9.0mm TO Flat glass cap
ML562G75**	Display	638	1400	-	35	φ9.0mm TO Flat glass cap
ML562H84	Display	638	-	2500	45	φ9.0mm TO Colimated lens cap
ML501P73	Display	638	500	1000	40	φ5.6mm TO Capless
ML520G73	Display	638	420	-	35	φ5.6mm TO Flat glass cap

★: New product ★★: Under development



Please visit our website for further details.



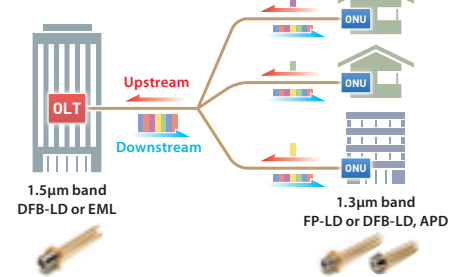
## OPTICAL DEVICES FOR OPTICAL COMMUNICATION SYSTEMS

### Laser Diodes and Photo Diodes for Fiber to the Home (FTTH)

GE-PON and G-PON are widely used in the FTTH fields in response to increasing data traffic caused by the Social Networking and the Cloud Computing. Our optical devices such as FP-LDs, DFB-LDs and APDs for GE-PON and G-PON have good delivery records.

In addition, next-generation FTTHs such as 10G-EPON and XG-PON are considered to introduce for future high-speed and large-capacity data communications. We also have products lineup for 10G-EPON and XG(S)-PON.

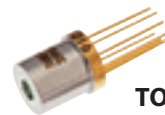
PON (Passive Optical Network)



### CAN EML Device for 10/25Gbps Transmission

Mitsubishi Electric has developed an electro-absorption modulation (EML) device with superior performance at high temperature and integrated it into a Peltier cooler, realizing a smaller package and lower power consumption. The T056 chassis—known for its excellent mass-production characteristics—is adopted. The products based on T056 package for many applications such as Ethernet / Sonet 40km, 80km, DWDM, PON are available.

In addition, an industry first TO-CAN package delivering 25Gbps EML are realized by leveraging improved bandwidth of the TO-CAN package. It improves customer productivity due to a simplified fabrication process.

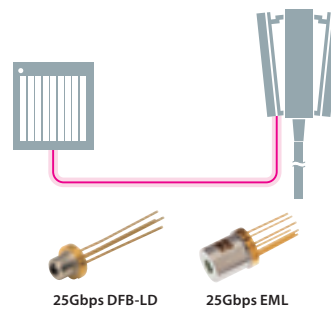


T056

<b>40km TDM</b> (10/25Gbps)	<b>80km TDM</b> (10Gbps)	<b>20km CWDM LWDM</b> (25Gbps)	<b>20km OLT PON</b> (10Gbps)
--------------------------------	-----------------------------	-----------------------------------	---------------------------------

### 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 T056 package to expand the connectivity of various products such as 25Gbps DFB and EML, and is ready to support the market growth of 5G mobile base station applications in the future.



25Gbps DFB-LD

25Gbps EML

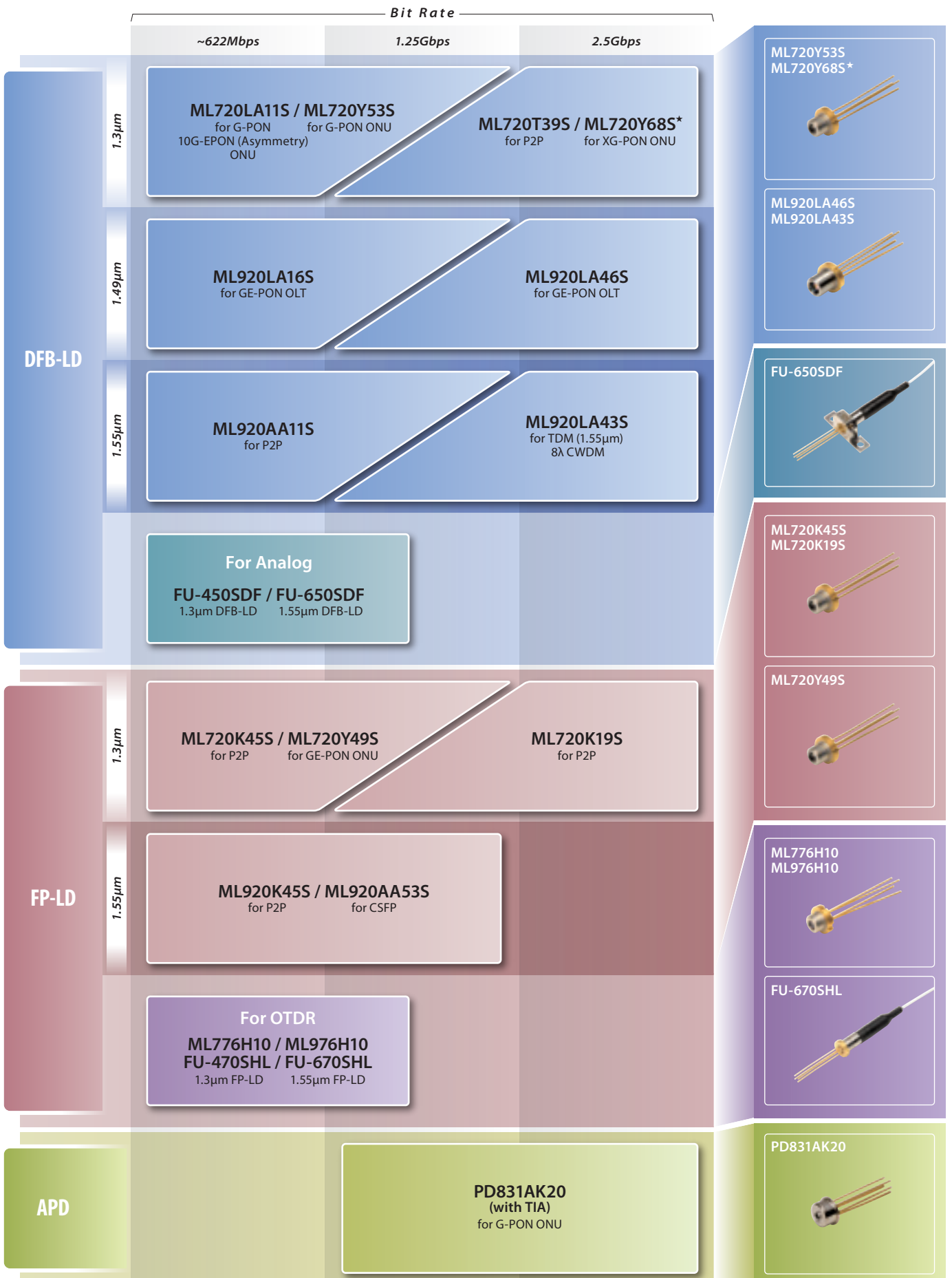
### Terminology

- APC ..... Angled Physical Contact
- APD ..... Avalanche Photo Diode
- APD TIA ..... Avalanche Photo Diode Trans Impedance Amplifier
- B-PON ..... Broadband Passive Optical Network
- CPRI ..... Common Public Radio Interface
- CWDM ..... Coarse Wavelength Division Multiplexing
- DFB-LD ..... Distributed FeedBack Laser Diode
- DWDM ..... Dense Wavelength Division Multiplexing
- EAM ..... Electro Absorption Modulator
- EML ..... Electro absorption Modulator integrated Laser diode
- ER ..... Extended Reach
- FP-LD ..... Fabry-Perot Laser Diode
- FR ..... Fiber Reach

- FTTH ..... Fiber To The Home
- G-PON ..... Gigabit Passive Optical Network
- GE-PON ..... Gigabit Ethernet Passive Optical Network
- LC ..... Lucent Connector
- LED ..... Light Emitting Diode
- LR ..... Long Reach
- LRM ..... Long Reach Multimode
- OLT ..... Optical Line Terminal
- ONU ..... Optical Network Unit
- OTDR ..... Optical Time Domain Reflectometer
- P2P ..... Peer to Peer
- PC ..... Physical Contact
- PD-TIA ..... Photo Diode with Trans-Impedance Amplifier
- RoF ..... Radio over Fiber

- ROSA ..... Receiver Optical Sub-Assembly
- SC ..... Single fiber Connector
- SDH ..... Synchronous Digital Hierarchy
- SFP+ ..... Small Form-factor Pluggable Plus
- SONET ..... Synchronous Optical Network
- TOSA ..... Transmitter Optical Sub-Assembly
- VSR ..... Very Short Reach
- X2 ..... 2nd Generation XENPAK
- XENPAK ..... 10 Gigabit Ethernet Transceiver Package
- XFP ..... 10 Gigabit small Form-factor Pluggable
- 10G-EPON ..... 10 Gigabit Ethernet Passive Optical Network
- XG-PON ..... 10 Gigabit Passive Optical Network
- XLMD-MSA ..... 40 Gbps Miniature Device Multi Source Agreement
- XMD-MSA ..... 10 Gbps Miniature Device Multi Source Agreement

## Selection Map of OPTICAL DEVICES [Under 2.5Gbps]



\*: New product

# Selection Map of OPTICAL DEVICES [Over 10Gbps]

		Bit Rate			
		10Gbps	25Gbps	100Gbps	400Gbps
EML	1.3μm		<b>ML760B54-92A</b> (1270, 1310) for 40km BiDi <b>ML760B54-92C*</b> (9λ 1273 ~ 1309) for 40km LAN-WDM	<b>FU-402REA-1/2</b> (28Gbps x 4λ) for 100Gbps 10/40km	<b>FU-402REA-4**</b> (50Gbps x 8λ) for 10km
	1.49μm	<b>ML958K59</b> for Bidirectional (Df=12.2mm) 40km <b>ML958H59</b> for Bidirectional (Df=10.2mm) 40km			
	1.55μm	<b>ML959B56</b> for 40km TDM <b>ML958N60</b> for 80km TDM <b>ML958J60*</b> for Bidirectional (Df=10.2mm) 80km <b>ML958N63</b> For 25km DWDM			
	1.577μm	<b>ML959A55</b> <b>ML959D55</b> for 10G-EPON OLT XG(S)-PON N1 OLT Combo-PON B+ <b>ML959A64</b> <b>ML959D64</b> for XG(S)-PON N2a OLT Combo-PON C+			
DFB-LD	1.3μm	<b>ML768K42T</b> for 10GBASE-LR <b>ML768LA42T</b> for CPRI <b>ML768T42T</b> <b>ML769T56T*</b> for 10G-EPON ONU	<b>ML764AA58T*</b> for 2km TDM <b>ML764K56T*</b> for 300m TDM	<b>ML7xx58</b> (25Gbps x 4λ) for 100G 2km CWDM	
					<b>ML768LA42T</b> <b>ML768T42T</b> <b>ML769T56T*</b>
APD		<b>PD831AH28</b> for 10G EPON ONU & 40km TDM		<b>FU-302RPA</b> (25Gbps x 4λ) for 100Gbps 40km	
					<b>FU-302RPA</b>



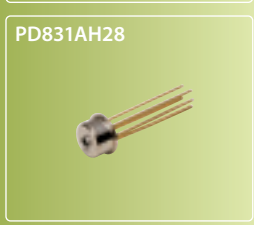
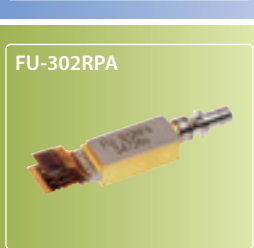
ML958K59 ML958J60\*  
ML958H59 ML958N63  
ML959B56 ML959A55  
ML958N60 ML959A64



ML959D55 ML959D64  
Flat glass cap



ML768LA42T  
ML768T42T  
ML769T56T\*



\*: New product \*\* : Under development

Line Up of LD / LD Modules [Under 2.5Gbps]

	Type Number	Chip Type	Package	Wavelength [nm]	Case Temp. [°C]	Features
2.5G	ML720T39S	DFB-LD	TO56-CAN	1310	-40~+95	P2P
	ML720Y68S*	DFB-LD	TO56-CAN	1270	-20~+85	XG-PON ONU, High coupling efficiency
	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
	ML920LA43S	DFB-LD	TO56-CAN	1470~1610 8λ CWDM	-10~+85	8λ CWDM
1.25G/ ~622M	ML720LA11S	DFB-LD	TO56-CAN	1310	-40~+85	G-PON ONU, 10G-EPON (Asymmetry) ONU
	ML720Y53S	DFB-LD	TO56-CAN	1310	-40~+85	G-PON ONU
	ML720K45S	FP-LD	TO56-CAN	1310	-40~+85	P2P
	ML720Y49S	FP-LD	TO56-CAN	1310	-40~+85	GE-PON ONU, High coupling efficiency
	ML920LA16S	DFB-LD	TO56-CAN	1490	-40~+85	GE-PON OLT
	ML920AA11S	DFB-LD	TO56-CAN	1550	-40~+85	P2P
	ML920K45S	FP-LD	TO56-CAN	1550	-40~+85	P2P
	ML920AA53S	FP-LD	TO56-CAN	1530	-40~+95	P2P, CSFP
For Analog	FU-450SDF	DFB-LD	Coaxial Pigtail	1310	-20~+85	CATV Return Path, RoF
	FU-650SDF	DFB-LD	Coaxial Pigtail	1550	-20~+85	CATV Return Path, RoF
For OTDR	FU-470SHL	FP-LD	Coaxial Pigtail	1310	-20~+70	OTDR
	FU-670SHL	FP-LD	Coaxial Pigtail	1550	-20~+70	OTDR
	ML776H10	FP-LD	TO56-CAN	1310	-40~+85	OTDR
	ML976H10	FP-LD	TO56-CAN	1550	-40~+85	OTDR

\*: New product

Line Up of APD [Under 2.5Gbps]

	Type Number	Chip Type	Package	Wavelength [nm]	Case Temp. [°C]	Features
2.5G	PD831AK20	APD	TO46-CAN	1490	-40~+85	Built-in TIA, G-PON ONU

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, it gives a laser beam. Even if we can't see a laser beam by its wavelength, 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. <ul style="list-style-type: none"> <li>• Never place the products in your mouth.</li> <li>• Never burn or break the products, or use any type of chemical treatment to reduce them to gas or powder.</li> <li>• When disposing of the products, always follow the laws which apply, as well as your own company's internal waste treatment regulations.</li> </ul>
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.

## Line Up of LD / LD Modules [Over 10Gbps]

	Type Number	Chip Type	Package	Wavelength [nm]	Case Temp. [°C]	Features
400G	FU-402REA-4**	EML	TOSA, LC Receptacle	LAN-WDM	-5~+80	50Gbps x 8λ, PAM4
100G	FU-402REA-1/2	EML	TOSA, LC Receptacle	LAN-WDM	-5~+80	28Gbps x 4λ
	ML7xx58	DFB-LD	TBD	4λ CWDM	+20~+70	25Gbps x 4λ
25G	ML764K56T*	DFB-LD	TO56-CAN	1310	-40~+90	25Gbps, SFP28, 300m (Df=5.8mm)
	ML764AA58T**	DFB-LD	TO56-CAN	1310	-40~+90	25Gbps, SFP28, 10km (Df=6.6mm)
	ML760B54-92A	EML	TO56-CAN	1270, 1310	-40~+95	Bidirectional, 25Gbps, SFP28, 40km
	ML760B54-92C*	EML	TO56-CAN	9λ 1273~1309	-40~+95	25Gbps, SFP28, 40km
10G	ML958K59	EML	TO56-CAN	1490	-5~+80	Bidirectional (Df=12.2mm) 40km
	ML958H59	EML	TO56-CAN	1490	-5~+80	Bidirectional (Df=10.2mm) 40km
	ML959B56	EML	TO56-CAN	1550	-5~+80	XFP/SFP+ 40km
	ML958N60	EML	TO56-CAN	1550	-5~+80	XFP/SFP+ 80km
	ML958J60*	EML	TO56-CAN	1550	-5~+80	Bidirectional (Df=10.2mm) 80km
	ML958N63	EML	TO56-CAN	1550	-40~+95	25km DWDM
	ML959A55	EML	TO56-CAN	1577	-5~+80	10G-EPON OLT, XG(S)-PON N1 OLT
	ML959D55	EML	TO56-CAN	1577	-5~+80	Combo-PON B+, Flat glass cap
	ML959A64	EML	TO56-CAN	1577	-5~+80	XG(S)-PON N2a OLT
	ML959D64	EML	TO56-CAN	1577	-5~+80	Combo-PON C+, Flat glass cap
	ML768K42T	DFB-LD	TO56-CAN	1310	-40~+95	10GBASE-LR, SONET/SDH
	ML768LA42T	DFB-LD	TO56-CAN	1270, 1330	-40~+95	CPRI
	ML768T42T	DFB-LD	TO56-CAN	1270	-5~+75	10G-EPON (Symmetry) ONU
	ML769T56T*	DFB-LD	TO56-CAN	1270	-40~+90	10G-EPON ONU (Df=10.1mm)

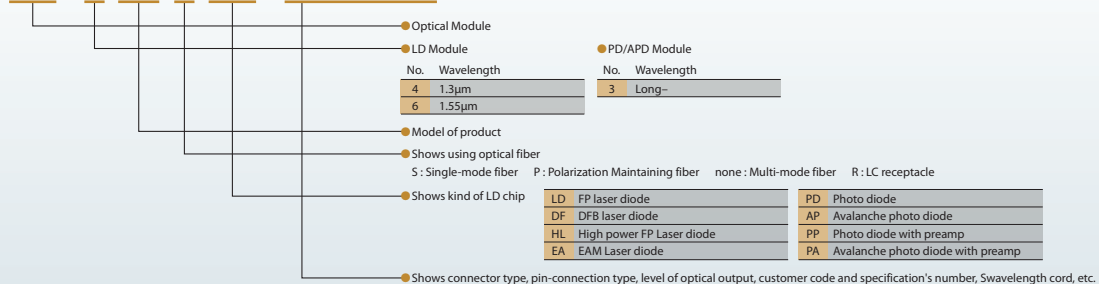
\*: New product \*\* : Under development

## Line Up of APD / APD Modules [Over 10Gbps]

	Type Number	Chip Type	Package	Wavelength [nm]	Case Temp. [°C]	Features
100G	FU-302RPA	APD	ROSA, LC Receptacle	LAN-WDM	-5~+80	25Gbps x 4λ, Built-in TIA, 40km
10G	PD831AH28	APD	TO46-CAN	1310 / 1577	-40~+90	Built-in TIA, 10G-EPON/XG-PON ONU & 40km

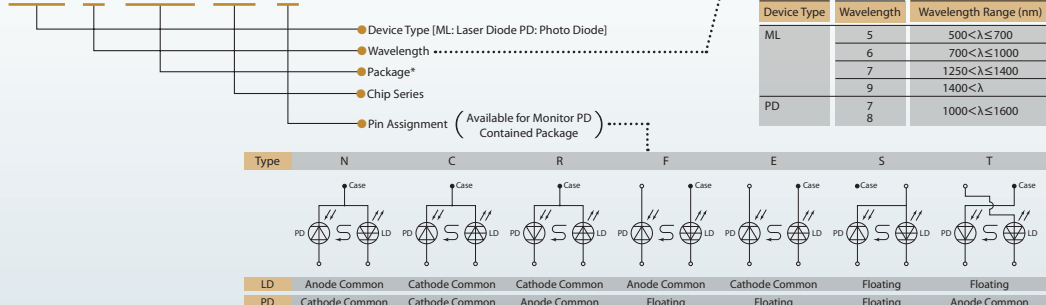
### Type Name Definition of Optical Devices for Optical Communication Systems

**FU - 6 50 S DF - FW1M15**



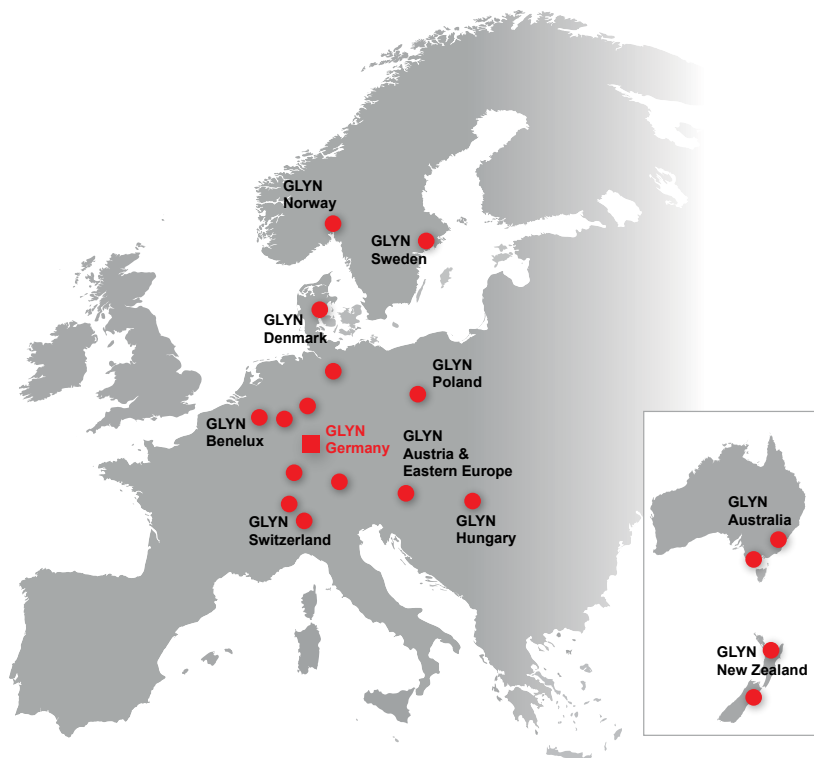
### Type Name Definition of Laser and Photo Diodes

**ML 7 68K 42 T**



\*Please contact our sales office about the selection packages.

# Global Support Network



## Germany

### GLYN GmbH & Co. KG Head Office

Am Wörtzgarten 8  
D-65510 Idstein  
[www.glyn.de](http://www.glyn.de)

Tel.: +49 6126 590-222  
[sales@glyn.de](mailto:sales@glyn.de)

**Nettetal**  
Tel.: +49 2157 124-222  
[nettetal@glyn.de](mailto:nettetal@glyn.de)

**Norderstedt**  
Tel.: +49 40 3204699-0  
[norderstedt@glyn.de](mailto:norderstedt@glyn.de)

**Pforzheim**  
Tel.: +49 7231 42441-00  
[pforzheim@glyn.de](mailto:pforzheim@glyn.de)

**Recklinghausen**  
Tel.: +49 2361 909027-0  
[recklinghausen@glyn.de](mailto:recklinghausen@glyn.de)

**Unterhaching**  
Tel.: +49 89 3216 4957-0  
[unterhaching@glyn.de](mailto:unterhaching@glyn.de)

## International

**Australia**  
GLYN Ltd.  
Tel.: +61 2 8850-0320  
[www.glyn.com.au](http://www.glyn.com.au)  
[sales@glyn.com.au](mailto:sales@glyn.com.au)

**Austria & Eastern Europe**  
GLYN GmbH & Co. KG  
(Germany)  
Tel.: +43 2236 311112-0  
[www.glyn.at](http://www.glyn.at)  
[sales@glyn.at](mailto:sales@glyn.at)

**Benelux**  
GLYN GmbH & Co. KG  
(Germany)  
Tel.: +31 6 10930497  
[www.glyn.com](http://www.glyn.com)  
[benelux@glyn.com](mailto:benelux@glyn.com)

**Denmark**  
GLYN GmbH & Co. KG  
(Germany)  
Tel.: +45 7020 1633  
[www.glyn-nordic.dk](http://www.glyn-nordic.dk)  
[sales@glyn-nordic.dk](mailto:sales@glyn-nordic.dk)

**Hungary**  
GLYN GmbH & Co. KG  
(Germany)  
Tel.: +36 1 204 9571  
[www.glyn.hu](http://www.glyn.hu)  
[sales@glyn.hu](mailto:sales@glyn.hu)

**New Zealand**  
GLYN Ltd.  
Tel.: +64 9 415-9150  
[www.glyn.co.nz](http://www.glyn.co.nz)  
[sales@glyn.co.nz](mailto:sales@glyn.co.nz)

**Norway**  
Link Nordic AS  
Tel.: +47 6988-9899  
[www.linknordic.com](http://www.linknordic.com)  
[sales@linknordic.com](mailto:sales@linknordic.com)

**Poland**  
GLYN GmbH & Co. KG  
(Germany)  
Tel.: +48 71 7828-758  
[www.glyn.pl](http://www.glyn.pl)  
[sales@glyn.pl](mailto:sales@glyn.pl)

**Sweden**  
GLYN GmbH & Co. KG  
(Germany)  
Tel.: +46 293 300-84  
[www.glyn.se](http://www.glyn.se)  
[sales@glyn.se](mailto:sales@glyn.se)

**Switzerland**  
GLYN GmbH & Co. KG  
Branch Office  
CH-8133 Esslingen / Egg  
Tel.: +41 44 944 55-00  
[www.glyn.ch](http://www.glyn.ch)  
[sales@glyn.ch](mailto:sales@glyn.ch)

© 2020-01 by GLYN GmbH & Co. KG

We will gladly provide you with further products from our manufacturers on request.  
Please note that in some countries, specific or restrictive agreements have been reached  
with various manufacturers.

WEEE-Reg.-Nr. DE: 77660497



# GLYN

High-Tech Distribution