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[Glossary and Application Notes](#)

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New Mitsubishi Laser Diodes



[Mitsubishi 35mW 658nm Laser Diode -- ML1016R -- Ø5.6mm package](#)



[Mitsubishi 35mW 685nm Laser Diode -- ML1012R -- Ø5.6mm package](#)



[Mitsubishi 50mW 785nm Laser Diode -- ML64114R -- Ø9mm package](#)

New Sanyo Laser Diodes



[Sanyo 20mW 635nm Laser Diode -- DL4038-025 -- Ø9mm package](#)



[Sanyo 70mW 785nm Laser Diode -- DL7040-201 -- Ø5.6mm package](#)



[Sanyo 100mW 830nm Laser Diode -- DL 7032-001 -- Ø9mm package](#)



[Sanyo 150mW 830nm Laser Diode -- DL 8032-001 -- Ø9mm package](#)

Ophir PD 200 Optical Power Meter



[New Low Price Includes Photodiode Sensor with Two Calibrated Wavelengths](#)

Diode Laser Modules



[Diode Laser Modules for OEM Applications -- Low Cost 635nm and 650nm](#)

Laser Diode Optics and Components



[NEW LENS — 4mm FL, 0.50 NA Molded Glass Asphere for Laser Diodes](#)

[Laser Diode Collimating and Objective Lenses](#)

[Multi-element Spherical Glass Lenses](#)

[Single element Molded Glass Aspheric Lenses](#)

[Injection Molded Plastic Aspheric Lenses](#)

[Achromats, Doublets, Singlets, Mirrors, Beamsplitters etc...](#)

[Laser Diode Mounting Kits](#)

Convenient laser diode mounting systems for 5.6 mm or 9 mm diodes, a variety of lens options for collimating or focusing the laser diode and several mechanical configurations available...

New mounting kits not shown in the Optima printed catalog are described here:

[LDM 1100 KIT](#) -- laser diode mount attaches to a standard optical bench post...

[ADP 9056 KIT](#) -- optics package for use with LDM 1100 KIT, includes 3 lenses...

[LDM 3400 KIT](#) -- with 6 different interchangeable apertures for beam shaping...

[LDM 4100 KIT](#) -- molded glass aspheric lens with 3 axis lens adjustment...

[LDM 4200 KIT](#) -- an extra long focal length lens with a 0.14 NA...

[LDM 4500 KIT](#) -- a short focal length lens provides a smaller collimated beam...

Collimated Diode Lasers

A laser diode and collimating lens pre-assembled into a compact cylindrical housing, the laser diode is collimated or focused to a specified distance

Anamorphic Prisms

Used for laser diode beam shaping (i.e. to circularize a laser diodes elliptical beam)

Visible and Near-Infrared Diode Laser Modules

With optical power starting at 1mW and available up to 50mW, operating in the visible range from 635nm to 685nm and near-infrared wavelength of 780nm.



[Diode Laser Modules for OEM Applications -- Low Cost 635nm and 650nm](#)

Line Generating Modules and Aspheric Line Generating Lenses

2-Axis and 4-Axis Precision Positioners

A unique mechanical component used to accurately position optics and optoelectronic components. Very compact and economical, ideally suited for use with lasers diodes, modules and fibers...

Technical Information / Application Notes

Company Profile:

Optima Precision manufactures high-quality optics, specialized mechanical components, and instruments for use with laser diodes. Optima also supplies [laser diodes](#) from many of the leading manufacturers i.e. [Mitsubishi](#) – [Sanyo](#) – [Sony](#) [Toshiba](#)

Offering both [aspheric](#) and [multi-element lenses](#), Optima lenses are specifically designed for collimating or focusing laser diodes. Lenses are available in either glass or plastic materials with a wide selection of focal lengths, numerical apertures, and mounting configurations. Cost effective for both OEM applications and/or R&D.

Several different [laser diode mounting kits](#) are offered – these mounting systems provide an essential heatsink for the standard Ø5.6mm and Ø9mm laser diode and use Optima's proprietary laser diode optics. The [LDM 3400 KIT](#) has interchangeable apertures for beam shaping.

[Precision Positioners](#) – A unique mechanical component used to accurately position optics and optoelectronic components. Very compact and economical, ideally suited for use with lasers diodes, modules and fibers...

Optima Precision Inc. / Contact, Terms and Ordering Information:

1. MINIMUM ORDER REQUIREMENTS: U.S. orders \$50.00; International orders \$100.00

2. TERMS OF PAYMENT: Credit card, C.O.D, or prepayment for all new customers and first time orders. Net 30 Days for established customers in good standing (subject to credit approval and periodic review). Past due balances are subject to a late charge of 1.5% per month. Date of invoice establishes the start of the 30-day payment period.

3. CREDIT CARDS ACCEPTED: MasterCard, VISA, or American Express -- Please do not transmit your Credit Card numbers via e-mail, this is not a secure website! Please fax or telephone cardholders name, credit card number and expiration date.

4. INTERNATIONAL CUSTOMERS: All international orders are payable in advance. Prices shown are in U.S Dollars, checks shall be drawn on a major U.S. bank, all bank charges at customer's expense. Letters of Credit are not acceptable.

5. SHIPPING TERMS: F.O.B West Linn, Oregon, unless specified otherwise.

6. PRICES: Subject to change without notice.

Orders may be placed by phone, fax, e-mail or regular mail.

Please do not transmit your Credit Card numbers via e-mail, this is not a secure website!



Credit Cards Accepted: MasterCard, VISA, or American Express

Telephone: (503) 638-2525

Fax: (503) 638-4545

Postal
address: 775 SW Long Farm Road, West Linn, Oregon 97068, U.S.A.

E-mail: sales@optima-optics.com

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Laser Diodes

Mitsubishi | **Sanyo** | **Sony** | **Toshiba** | **Hitachi**



[DIODES.PDF](#) (84K) Click on the file name to download an Adobe PDF file covering this section.

Laser diodes continue to find new product applications as the lasing wavelength is pushed lower into the visible spectrum. The latest generation of Visible Laser Diodes (VLD's) operate at or near 635nm; this wavelength being equivalent to a helium neon gas laser, is highly visible to the human eye. VLD's in the range from 635nm to 690nm are replacing the traditional HeNe laser in many commercial products for good reasons: lower cost, compact size, and superior long-term reliability. Another intrinsic benefit, laser diodes are generally better suited for battery operated devices and other low voltage applications.

While visible diodes are used extensively in commercial products, the near-infrared diodes are certainly not extinct. There are many applications still using lasers operating in the 780nm~850nm range as some machine vision systems and sensors are optimized for near-infrared light sources. The near-infrared diodes may not be considered as user-friendly as the VLD's; however, with the right tools, some of the inconveniences can be managed. In either case, visible or near-infrared, we stock a selection of the more popular laser diodes from several different manufacturers.

Hitachi: Optima is no longer using, selling, or supporting Hitachi laser diodes. As of April 99 there is some stock available, please refer to the [Optima Laser Diode Close-Out Page](#) for details.

MITSUBISHI Visible and Near-infrared Laser Diode Specifications

Several new diodes listed below are in stock now

[ML1016R](#) 658nm / 35mW / 5.6mm

[ML1012R](#) 685nm / 35mW / 5.6mm

[ML60116R](#) Near-infrared 785nm / 40mW / 5.6mm

[ML60114R](#) Near-infrared 785nm / 60mW / 5.6mm

[ML64114R](#) Near-infrared 785nm / 60mW / 9mm

For additional specifications, click on the part number listed in the table below:

Part number	Qty 1 - 49	Wavelength (nm)	Max laser power (mW)	Mode	Package Size (dia)	Current (I _{th}) Typ (mA)	Current (I _{op}) Typ (mA)	Divergence (FWHM deg)	
								Parallel	Perpendicular
ML1016R	\$41.70	658	35	S	5.6mm	45	85	8.5	22
ML1012R	\$37.30	685	35	S	5.6mm	35	80	9.5	20
ML60116R	\$24.60	785	40	S	5.6mm	30	80	10	25
ML60114R	\$41.70	785	60	S	5.6mm	55	140	10	25
ML64114R	\$52.30	785	60	S	9mm	55	140	10	25

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SANYO Laser Diode Specifications

Several new diodes in stock

DL 3148-011 635nm / 5mW / 5.6mm / low cost

DL 3147-011 645nm / 5mW / 5.6mm / low cost

DL 4038-025 635nm / 20mW / 9mm

DL 3147-041 645nm / 5mW / 5.6mm

DL 3147-261 645nm / 7mW / 5.6mm

DL 3149-054 ... 670nm / 5mW / 5.6mm

DL 4039-011 670nm / 10mW / 9mm

DL 7032-001 Near-infrared 830nm /

DE 7032 001 Near infrared 850nm /
DL 8032 001 Near infrared 830nm /

DE 8052-001 Near-infrared 850nm /
DL 7140.201 Near infrared 785nm /

DE 7140-201 Near-infrared / 85nm / 70mW / 5.0mm

For detailed specifications, click on the part number listed in the table below:

Part number	Qty 1 - 49	Wavelength (nm)	Max laser power (mW)	Mode	Package Size (dia)	Current (I _{th}) Typ (mA)	Current (I _{op}) Typ (mA)	Divergence (FWHM deg)	
								Parallel	Perpendicular

DL3148-011	\$22.50	635	5	S	5.6mm	40	55	8	30
DL3038-033	\$35.30	635	5	S	9mm	30	40	8	35
DL4038-021	\$73.00	635	10	S	9mm	35	55	8	30
DL4038-025	\$337.00	635	20	S	9mm	45	80	7	25
DL3147-011	\$9.70	645	5	S	5.6mm	30	40	7.5	30
DL3147-041	\$16.90	645	5	S	5.6mm	45	60	7.5	30
DL3147-261	\$18.30	645	7	S	5.6mm	45	60	7.5	30
DL3149-054	\$14.60	670	5	S	5.6mm	30	45	8	33
DL4039-011	\$32.80	675	10	S	9mm	40	60	8	30
DL7140-201	\$50.90	785	70	S	5.6mm	30	100	7	17
DL7032-001	\$212.70	830	100	S	9mm	40	140	7	18
DL8032-001	\$365.00	830	150	S	9mm	40	185	7	18

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SONY Visible Diode Specifications

[SLD1132VS](#) 635nm / 5mW / 5.6mm package

[SLD1134VL](#) 655nm / 5mW / 5.6mm package / Self-pulsation type diode for low noise

For additional specifications, click on the part number listed in the table below:

Part number	Qty 1 - 49	Wavelength (nm)	Max laser power (mW)	Mode	Current (I _{th}) Typ (mA)	Current (I _{op}) Typ (mA)	Divergence (FWHM deg)	
							Parallel	Perpendicular
SLD1132VS	\$29.20	635	5	S	50	60	7	32
SLD1134VL	\$16.50	655	5	S	65	75	8.5	35

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TOSHIBA Visible Laser Diode Specifications

Toshiba TOLD 9441 MCDA 650nm / 7mW / 5.6mm Now in Stock !!

For additional specifications, click on the part number listed in the table below:

Part number	Qty 1 - 49	Wavelength (nm)	Max laser power (mW)	Mode	Current (I _{th}) Typ (mA)	Current (I _{op}) Typ (mA)	Divergence (FWHM deg)	
							Parallel	Perpendicular
<u>TOLD9441MCDA</u>	\$22.50	650	7	S	40	50	8	28
<u>TOLD9442MDA</u>	\$13.25	650	5	S	30	35	8	28
<u>TOLD9442M</u>	\$11.80							
<u>TOLD9231MDA</u>	\$33.30	670	5	M	50	60	10	32
<u>TOLD9231M</u>	\$22.60							
<u>TOLD9225MDA</u>	\$38.60	670	10	S	45	70	8	18
<u>TOLD9225M</u>	\$35.40							

The suffix letter "M" designates a Ø5.6mm package, the letter "F" designates a Ø9mm package.

The suffix letters "DA" indicates the diode package has test data attached - Po, I_{th}, I_{op}, wavelength, divergence, etc.

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Laser Diodes

Mitsubishi, Sanyo, Sony, and Toshiba — 635 nm to 830 nm, 3mW to 150mW

Laser diodes continue to find new product applications as the lasing wavelength is pushed lower into the visible spectrum. The latest generation of Visible Laser Diodes (VLD's) operate at or near 635nm; this wavelength being equivalent to a helium neon gas laser, is highly visible to the human eye. VLD's in the range from 635nm to 690nm are replacing the traditional HeNe laser in many commercial products for good reasons: lower cost, compact size, and superior long-term reliability. Another intrinsic benefit, laser diodes are generally better suited for battery operated devices and other low voltage applications. Please refer to the Optima website for additional information and specifications — <http://www.optima-optics.com>

Mitsubishi Visible and Near-Infrared Laser Diode Specifications:

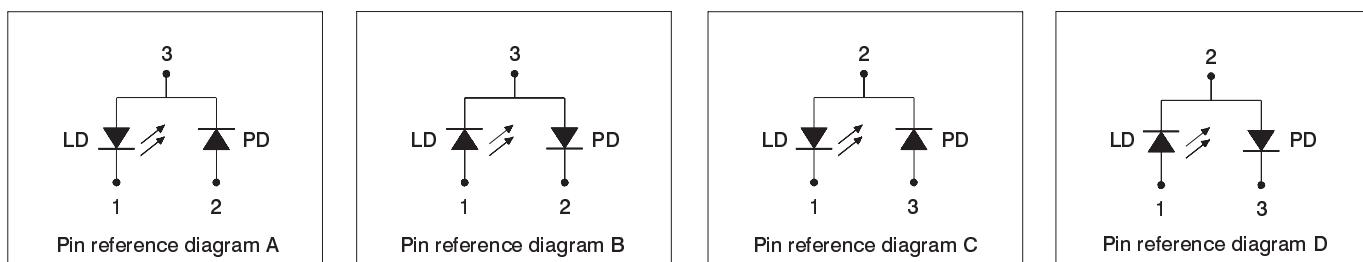
PART NUMBER	PRICE	WAVE LENGTH (nm)	MAX LASER POWER (mW)	MODE	THRESHOLD CURRENT TYP (mA)	OPERATING CURRENT TYP (mA)	PARALLEL DIVERGENCE FWHM (deg)	PERPENDICULAR DIVERGENCE FWHM (deg)	PIN REF	BASE DIMENSION (mm)
ML 1016R	\$41.70	658	35	S	45	85	8.5	22	B	Ø5.6
ML 1012R	\$37.30	685	35	S	35	80	9.5	20	B	Ø5.6
ML 44126N	\$25.20	785	8	S	25	40	11	29	A	Ø9.0
ML 60116R	\$24.60	785	40	S	30	80	10	25	B	Ø5.6
ML 60114R	\$41.70	785	60	S	55	140	10	25	B	Ø5.6
ML 64114R	\$52.30	785	60	S	55	140	10	25	B	Ø9.0

Sanyo visible and Near-Infrared Laser Diode Specifications:

PART NUMBER	PRICE	WAVE LENGTH (nm)	MAX LASER POWER (mW)	MODE	THRESHOLD CURRENT TYP (mA)	OPERATING CURRENT TYP (mA)	PARALLEL DIVERGENCE FWHM (deg)	PERPENDICULAR DIVERGENCE FWHM (deg)	PIN REF	BASE DIMENSION (mm)
DL 3148-011	\$22.50	635	5	S	40	55	8	30	C	Ø5.6
DL 3038-033	\$35.20	635	5	S	30	40	8	35	C	Ø9.0
DL 4038-031	\$73.00	635	10	S	35	55	8	30	C	Ø9.0
DL 4038-025	\$337.00	635	20	S	45	80	7	25	C	Ø9.0
DL 3147-011	\$9.70	645	5	S	30	40	7.5	30	C	Ø5.6
DL 3147-041	\$16.90	645	5	S	45	60	7.5	30	C	Ø5.6
DL 3147-261	\$18.30	645	7	S	45	60	7.5	30	D	Ø5.6
DL 3149-054	\$14.60	670	5	S	30	45	8	33	C	Ø5.6
DL 4039-011	\$32.80	675	10	S	40	60	8	30	C	Ø9.0
DL 3149-070	\$77.70	685	5	M	40	50	8.5	37	C	Ø5.6
DL 7140-201	\$50.90	785	70	S	30	100	7	17	D	Ø5.6
DL 7032-001	\$212.70	830	100	S	40	140	7	18	C	Ø9.0
DL 8032-001	\$384.00	830	150	S	40	185	7	18	C	Ø9.0

★ New product

Schematic Diagram of Laser Diode / Photodiode — Internal Circuit Connections:



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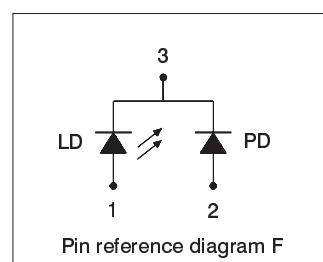
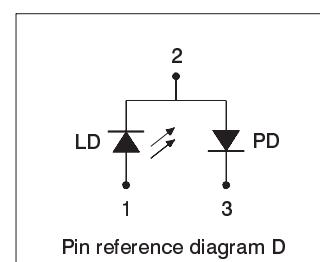
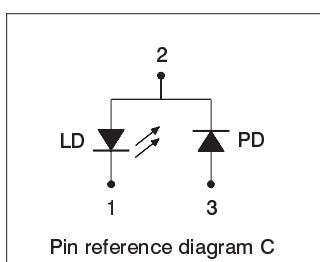
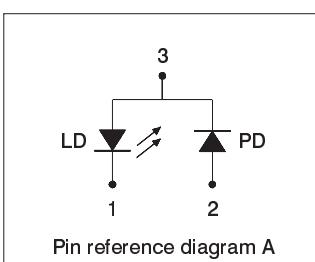
Sony Visible Laser Diode Specifications:

PART NUMBER	PRICE	WAVE LENGTH (nm)	MAX LASER POWER (mW)	MODE	THRESHOLD CURRENT TYP (mA)	OPERATING CURRENT TYP (mA)	PARALLEL DIVERGENCE FWHM (deg)	PERPENDICULAR DIVERGENCE FWHM (deg)	PIN REF	BASE DIMENSION (mm)
SLD 1132 VS	\$29.20	635	5	S	50	60	7	32	A	Ø5.6
SLD 1134 VL	\$16.50	655	5	S	65	75	8.5	35	F	Ø5.6

Toshiba Visible Laser Diode Specifications:

PART NUMBER	PRICE	WAVE LENGTH (nm)	MAX LASER POWER (mW)	MODE	THRESHOLD CURRENT TYP (mA)	OPERATING CURRENT TYP (mA)	PARALLEL DIVERGENCE FWHM (deg)	PERPENDICULAR DIVERGENCE FWHM (deg)	PIN REF	BASE DIMENSION (mm)
TOLD 9442 M	\$11.80	650	5	S	30	35	8	28	C	Ø5.6
TOLD 9442 MDA	\$13.25									
TOLD 9441 MCDA	\$22.50	650	7	S	40	50	8	28	D	Ø5.6
TOLD 9231 M	\$22.60	670	5	M	50	60	10	32	C	Ø5.6
TOLD 9231 MDA	\$33.30									
TOLD 9225 M	\$35.40	670	10	S	45	70	8	18	C	Ø5.6
TOLD 9225 MDA	\$38.60									

Schematic Diagram of Laser Diode / Photodiode — Internal Circuit Connections:





Laser Diode Close-Out List

To check current stock availability please contact: sales@optima-optics.com

Hitachi

Part number	Qty 1 - 49	Wavelength (nm)	Max laser power (mW)	Mode	Current (I _{th}) Typ (mA)	Current (I _{op}) Typ (mA)	Divergence (FWHM deg)	
							Parallel	Perpendicular
HL6319G *	\$65.90	635	10	S	50	70	8	31
HL6714G	\$62.50	670	10	S	35	~45	8	22
HL6726MG **	\$52.50	685	30	S	50	~95	8.5	19
HL1326MF	\$95.20	1310	5	M	8	~25	30	40

* The internal circuit configuration of the HL6313G, HL6319G, HL6726MG, HL6738MG allows operation with a single positive supply voltage -- this also allows grounding the laser diode case and the heatsink structure if used.

** HL1326MF and HL6726MG have a Ø5.6mm package, all other Hitachi diodes listed above have a Ø9mm package.

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Laser Diode Specifications

Optima is no longer recommending, selling, or supporting Hitachi laser diodes.

All Hitachi laser diode specifications have been removed from the Optima website.

Possible substitute part: None

Detailed specifications and pricing for laser diodes from other manufacturers are listed in the main Optima laser diode page. Please click on the following link for more information:

<http://www.optima-optics.com/ld.htm>

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Laser Diode Specifications

Optima is no longer recommending, selling, or supporting Hitachi laser diodes.

All Hitachi laser diode specifications have been removed from the Optima website.

Possible substitute [Toshiba TOLD9225M](#) (ø5.6mm package)
parts: [Sanyo DL4039-011](#) (ø9mm package)
[Sanyo DL3147-261](#) (ø5.6mm package)

Detailed specifications and pricing for laser diodes from other manufacturers are listed in the main Optima laser diode page.

Please click on the following link for more information:

<http://www.optima-optics.com/ld.htm>

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Laser Diode Specifications - Toshiba TOLD9225M



[TOLD9225.PDF](#) (83K) Click on the file name to download an Adobe PDF file covering this page.

670nm / 10mW / 5.6mm package

Absolute Maximum Ratings (Tc=25°C)

Characteristic	Symbol	Value	Unit
Optical output power	Po	10	mW
Laser diode reverse voltage	V _{R(LD)}	2	V
Photodiode reverse voltage	V _{R(PD)}	30	V
Operating temperature	T _{opr}	-10 to +60	°C
Storage temperature	T _{stg}	-40 to +85	°C

TOLD9225M 5.6mm Package
Internal Circuit & Pin Connections

Optical and Electrical Characteristics (Tc=25°C)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	I _{th}	-	40	60	mA	-
Operating current	I _{op}	-	60	80	mA	Po=10mW
Laser diode operating voltage	V _{op}	-	2.4	3.0	V	Po=10mW
Lasing wavelength	λ _p	660	670	680	nm	Po=10mW
Beam divergence (parallel)	θ //	5	8	11	deg	Po=10mW (FWHM)
Beam divergence (perpendicular)	θ ⊥	15	18	23	deg	Po=10mW (FWHM)
Monitor current	I _m	0.1	0.2	0.5	mA	Po=10mW
Photodiode dark current	I _{D (PD)}	-	-	100	nA	VR=5V

Photodiode total capacitance	CT (PD)	-	-	20	pF	VR=5V, f=1MHz
Astigmatism	As	-	6	-	microns	-

Disclaimer: The laser diode information summarized above is based on the respective diode manufacturer's commercial catalog and/or data sheet specifications. The data is presumed to be accurate; however, it is subject to change without notice. Optima makes no representation as to the accuracy of the information and does not assume any responsibility for errors or omissions contained herein. The user must refer to the manufacturers specifications for details concerning the intended application and operation, diode limitations, and safety.

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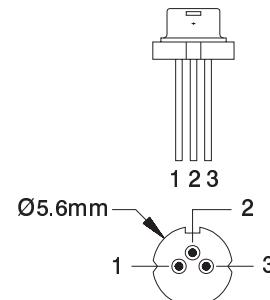
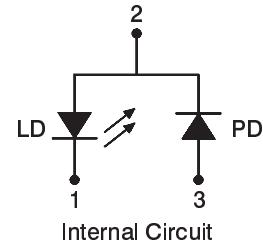
os i a LD 22

Laser Diode pe ifi a io s

The Toshiba TOLD9 5 is an index guided laser diode with a multi-quantum well structure. The maximum optical output is 10mW with a typical operating wavelength of 630nm. The TOLD9 5 has a Ø5.6mm package.

Absolute Maximum Ratings (Tc = 5 °C)

Characteristic	Symbol	Value	Unit
Optical output power	Po	10	mW
Laser diode reverse voltage	VR(LD)	2	V
Photodiode reverse voltage	VR(PD)	30	V
Operating temperature	Topr	-10 to +60	°C
Storage temperature	Tstg	-40 to +85	°C



Package Type: Ø5.6mm

Operating and Electrical Characteristics (Tc = 5 °C)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	Ith	—	40	60	mA	—
Operating current	Iop	—	60	80	mA	Po=10mW
Operating voltage	Vop	—	2.4	3.0	V	Po=10mW
Lasing Wavelength	λp	660	670	680	nm	Po=10mW
Beam divergence (parallel)	θ //	5	8	11	deg	Po=10mW, (FWHM)
Beam divergence (perpendicular)	θ ⊥	15	18	23	deg	Po=10mW, (FWHM)
Monitor current	Im	0.1	0.2	0.5	mA	Po=10mW
Photodiode dark current	ID(PD)	—	—	100	nA	VR(PD)=5V
Photodiode total capacitance	CT(PD)	—	—	20	pF	VR(PD)=5V, f=1MHz
Astigmatism	As	—	6	—	microns	—

Disclaimer: The laser diode information summarized above is based on the respective diode manufacturer's commercial catalog and/or data sheet specifications. The data is presumed to be accurate; however, it is subject to change without notice. Optima makes no representation as to the accuracy of the information and does not assume any responsibility for errors or omissions contained herein. The user must refer to the manufacturers specifications for details concerning the intended application and operation, diode limitations, and safety.

For current pricing and stock availability please contact:

Optima Precision Inc. 5 SW Longwood West Linn, Oregon 97040 U.S.A.

Phone: (503) 638-5550 Email: optima@optima-optics.com

Website: <http://www.optima-optics.com>



Glossary, Application Notes, and FAQ's

[Terms Describing Laser Diode
Absolute Maximum Ratings](#)

[Terms Describing Laser Diode
Electro-optical Characteristics](#)

[Terms Describing Laser Diode
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Terms Describing Laser Diode Absolute Maximum Ratings:

Commonly used abbreviations are shown in parenthesis.

Case Temperature (T_c) – Device temperature measured at the base of the package.

Operating Temperature (T_{opr}) – Range of case temperatures within which the device may be safely operated.

Optical Power Output (P_o) – Maximum allowable instantaneous optical power output in either continuous (CW) or pulse operation. Up to this point, there are no kinks in the optical power output vs. forward current curve.

Important note: The optical power output specification is applicable to the bare laser diode – it does not allow for, or take into consideration, any optics that may be in the optical path, such as a collimating lens located between the laser diode and a power meter or other detector.

Caution: Do not exceed the specified optical power output -- even an instantaneous (less than a nanosecond) application of excessive current or voltage may cause deterioration or catastrophic optical damage (COD) to the facets.

Reverse Voltage (V_R) – Maximum allowable voltage when reverse bias is applied to the laser diode or photodiode. For laser diodes with an internal monitor photodiode, the reverse voltage is specified for the laser diode as V_R (LD) and for the photodiode as V_R (PD).

Storage Temperature (T_{stg}) – Range of case temperatures within which the device may be safely stored.

Terms Describing Laser Diode Electro-optical Characteristics:

Commonly used abbreviations are shown in parenthesis.

Automatic Power Control (APC) – Laser diode drive circuit based on a photodiode feedback loop that monitors the optical output and provides a control signal for the laser diode which maintains the operation at a constant optical output level. See additional information below on [Drive Circuits](#) and [Operating in Constant Power Mode vs. Constant Current Mode](#).

Automatic Current Control (ACC) or Constant Current – Laser diode drive circuit that operates the laser diode without a photodiode feedback loop, the laser diode is simply driven at constant current. The optical output will fluctuate as the laser diode temperature changes. See additional information below on [Drive Circuits](#) and [Operating in Constant Power Mode vs. Constant Current Mode](#).

Fall Time – Time required for the optical output to fall from 90% to 10% of its maximum value.

Mode Hopping – As the temperature of the laser chip increases, the operating wavelength also increases. Rather than a smooth, continuous transition in the operating wavelength, the wavelength makes discrete jumps to the longer wavelength modes. The phenomenon is referred to as "mode hopping" or "mode jumps".

Monitor Current (Im) – The current through the photodiode, at a specified reverse bias voltage, when the laser diode is producing its typical optical power output. Note: The manufacturers data may list specifications based on operation at lower optical output power than the devices absolute maximum rating. For example, the test condition might be 20mW for a diode with an absolute maximum optical output of 30mW.

Operating Current (Iop) – The amount of forward current through the laser diode necessary to produce the specified typical optical output at a specified operating temperature.

Operating Voltage (Vop) – The forward voltage across the laser diode when the device produces its specified typical optical output at a specified operating temperature.

Photodiode Dark Current (ID(PD)) – The current through the reverse biased internal monitor photodiode when the laser diode is not emitting.

Positional Accuracy (Δx , Δy , Δz) – Also referred to as emission point accuracy. These specifications define the positional accuracy of the laser diode emitter with respect to the device package. Delta x and delta y are measured as the planer displacement of the chip from the physical axis of the package. Delta z is measured perpendicular to the reference surface. Specifications may list both angular error expressed in degrees and the linear error in microns.

Rise Time – Time required for the optical output to rise from 10% to 90% of its maximum value.

Slope Efficiency (SE) or (η) – Also referred to as differential efficiency. This is the mean value of the incremental change in optical power for an incremental change in forward current when the device is operating in the lasing region of the optical power output vs. forward current curve.

Threshold Current (Ith) – The boundary between spontaneous emission and the stimulated emission shown on the optical power output vs. forward current curve. Below the threshold current point, the output resembles the incoherent output from a LED; at or above the specified threshold current, the device begins to produce laser output. Once past the threshold point, stimulated emission is achieved and the optical output increases significantly for a small increase in forward current.

Wavelength (λ_p) – The wavelength of light emitted by the laser diode. For a single mode device, this is the wavelength of the single spectral line of the laser output. For a multi-mode device, this is the wavelength of the spectral line with the greatest intensity.

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Terms Describing Laser Diode Optical Characteristics:

Commonly used abbreviations are shown in parenthesis.

Aspect Ratio (AR) – The ratio of the laser diode's divergence angles, θ_{\perp} (perpendicular) and θ_{\parallel} (parallel). A diode with a 27° perpendicular divergence and a 9° parallel divergence has an elliptical beam with an aspect ratio of 3:1. Please refer to the [laser diode mounting kit page](#) to see the difference between a nearly circular beam and the typical elliptical beam.

Astigmatism (As) or (ΔAs) – The laser beam appears to have different source points for the directions perpendicular and parallel to the junction plane. The astigmatic distance is defined as the distance between the two apparent sources. A laser diode with a large amount of astigmatism must have the astigmatism corrected (or reduced) if the laser diode output is to be accurately focused – otherwise, the resulting focused beam will be astigmatic.

Beam Divergence (θ_{\perp}) and (θ_{\parallel}) – Also referred to as radiation angles. The beam divergence is measured as the full angle and at the half-maximum intensity point, known as Full Width Half Maximum or FWHM. Angular specifications are provided for both the perpendicular axis and parallel axis.

Coupling Efficiency – The beam from the laser diode diverges as defined by the beam divergence specification. In coupling the laser diodes widely divergent beam into a lens or other device such as a fiber, the result is typically less than 100%. Coupling efficiency is defined as the percentage of total power output from the laser which effectively enters the external device (i.e. a lens or fiber).

Far Field Pattern (FFP) – Intensity profile of the beam when measured at a distance from the front facet of the laser diode chip.

Multimode Diodes – Laser diodes have either single or multiple longitudinal modes. For a multimode laser diode the emission spectrum consists of several individual spectral lines with a dominant line (line with the greatest intensity) occurring at the nominal wavelength of the device. Multimode laser diodes are often desirable as problems with mode hops are suppressed – consequently, multimode diodes generally have a better signal-to-noise ratio.

Near Field Pattern (NFP) – Intensity profile of the beam when measured at the front facet of the laser diode chip.

Numerical Aperture (NA) – The numerical aperture describes the ability of a lens to collect light from a source placed at its focal point. The maximum acceptance angle θ , is measured from the center axis of the cone of light to the outside or surface of the cone.

Polarization Ratio – The output from a single cavity laser diode is linearly polarized parallel to the laser junction. Spontaneous emission with a random polarization and/or with a polarization perpendicular to the laser junction is also present. The polarization ratio is defined as the parallel component divided by the perpendicular component. For a diode operating near its maximum power the ratio is typically greater than 100:1. When operating near the threshold point, the ratio would be considerably lower as the spontaneous emission becomes more significant.

Single-mode Diodes – Laser diodes have either single or multiple longitudinal modes. For a single-mode laser diode the emission spectrum consists of a single spectral line occurring at the nominal wavelength of the device. At output levels near threshold, multiple spectral lines may be present in the emission spectrum however, these secondary lines decrease as the output increases.

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FAQ's and Laser Diode Basics:

There are a number of precautions listed in the laser diode manufacturer's catalogs that should be observed when working with laser diodes. Below are a few points that might be helpful if you're new to this field:

Safety Considerations – The laser beam emitted by the laser diode is harmful if aimed directly into the human eye. Never look directly into the laser beam or at any specular reflections of the laser beam.

Electro-Static Discharge – Laser diodes are extremely sensitive devices and visible laser diodes (VLD's) tend to be the most sensitive type. The handling precautions outlined by the laser diode manufacturers are not overstated – good work habits require personal grounding straps and grounded equipment. ESD does damage laser diodes!

Drive Circuits – Laser diodes should always be driven by either a Constant Current or Automatic Power Control (APC) circuit (the APC circuit may also be referred to as a Constant Power Mode circuit). For simplicity, an APC circuit is generally preferred, especially if the ambient temperature fluctuates. Typical circuits include slow-start or soft-start circuitry and provisions to ensure that spikes, surges, and other switching transients are eliminated. Regardless of type of circuit used, the drive current must not overshoot the maximum operating level - exceeding the maximum optical output for even a nanosecond will damage the mirror coatings on the laser diode end facets.

A standard laboratory power supply is not suitable for driving a laser diode.

Examples of the recommended drive circuits can be found in most manufacturer's laser diode data books. Unless you have prior experience with laser diodes and/or their drive circuits, this is not a place to reinvent the wheel - it can be very frustrating and expensive.

Operating in Constant Power Mode vs. Constant Current Mode – The characteristics of a laser diode are highly dependent on the temperature of the laser chip. For instance, the wavelength of a typical GaAlAs diode will increase on the order of 0.25nm for a 1°C rise in temperature. With a single mode diode, the change in wavelength may produce an undesirable effect known as “mode hops or mode-hopping”.

Other characteristics directly related to laser diode's operating temperature are; threshold current, slope efficiency, wavelength, and lifetime. Perhaps the most important characteristic is the effect of temperature on the relationship between the diode's optical output and the injection current. In this case, the optical output decreases as the operating temperature increases or, conversely the optical output increases as the operating temperature decreases. Without limits and safeguards built into the laser drive circuit, a wide swing in operating temperature could be catastrophic. However, there are two techniques commonly used to achieve a stable optical output from a laser diode:

Constant Current mode combined with precise control of the diode's operating temperature is generally the preferred operating method. The constant current mode provides a faster control loop and a precision current

reference for accurately monitoring the laser current. Further, in many cases the laser diode's internal photodiode may exhibit drift and have poor noise characteristics. If performance of the internal photodiode is inferior, the diode's optical output is likely to be noisy and unstable as well.

Constant Current operation without temperature control is generally not desirable – if the operating temperature of the laser diode decreases significantly, the [optical power output](#) will increase and could easily exceed the absolute maximum.

Constant Power or APC mode precludes the possibility of the optical power output increasing as the laser diode's temperature decreases. However, when operating in the constant power mode and without temperature control, mode hops and changes in wavelength will still occur. Further, if the diode's heat sink is inadequate and the temperature is allowed to increase, the optical power will decrease. In turn, the drive circuit will increase the injection current, attempting to maintain the optical power at a constant level. Without an absolute current limit thermal runaway is possible and the laser may be damaged and/or destroyed.

Summary – for stable operation and maximum laser lifetime – temperature control and constant current operation is generally the best solution. However, if precise temperature control of the laser diode is not practical, then an APC circuit should be used.

Drive Circuit Precautions – Even when a laser diode is driven by a suitable drive circuit, watch for possible intermittent or unreliable connections between the laser diode and the drive circuit. An intermittent contact in the photodiode feedback circuit will very likely destroy the laser diode. One not-so-obvious component to consider is the power control. If a potentiometer is used for setting the laser diode's power, evaluate the circuit design to determine the failure mode if the potentiometer's wiper breaks contact with the resistive element. Also, never use a switch or relay to make or break the connection between the drive circuit and the laser diode.

Power Measurements – The output from a laser diode must be measured with an optical power meter or a calibrated, large area photodiode. It's not practical or safe to estimate a laser diode's output power based on the diode manufacturers minimum-maximum data as each diode has unique operating characteristics and manufacturing tolerances.

Remember, once the laser diode is past the threshold point, stimulated emission is achieved and the optical output increases significantly for a small increase in forward current. Therefore, a very slight increase in drive current may cause the optical output to exceed the absolute maximum. Even with a visible diode, it's not feasible to judge the laser output by eye, an optical power meter or calibrated photodetector must be used.

Also, be sure to include optical losses through any lenses or other components when making measurements or calculations.

Operating Temperature and Heat Sinks – In most applications, laser diodes require heat sinks especially when operated continuously (CW). Without a heat sink the laser diode junction temperature will quickly increase causing the optical output to degrade. If the laser diode temperature continues to rise, exceeding the maximum operating temperature, the diode can be catastrophically damaged or the long term performance may degrade significantly. Generally, a lower operating temperature will help extend the diode's lifetime as the laser diode's reliability and MTTF are directly related to the junction temperature during operation. VLD's with lower wavelengths, i.e. ~635nm, appear to be more sensitive to temperature and users might consider thermoelectric cooling if operating in an environment with elevated ambient temperatures or if operational stability is a prerequisite. Also, using a small amount of a non-silicone type heat sink compound will improve thermal conductivity between the diode and heat sink.

Lifetime note: If the laser diode's operating temperature is reduced by about 10 degrees, the lifetime will statistically double.

Windows – Keep the laser diode window, and any other optics in the path, clean. Dust or fingerprints will cause diffraction or interference in the laser output that can result in lower output or anomalies in the far-field pattern. The window should be cleaned using a cotton swab and ethanol when necessary.

Cyanoacrylate Adhesive Precaution – "Super glue" should not be used anywhere near laser diodes - or near any other optical component - outgassing may fog windows and other optical surfaces. The amount of fogging, or the time required to observe the fogging, varies with different products. If you're in doubt, test the adhesive over time at an elevated temperature and in a sealed container. For example, place a drop of the adhesive in question on a piece of glass, something like a microscope slide, then place the sample in a plastic bag and seal the bag.

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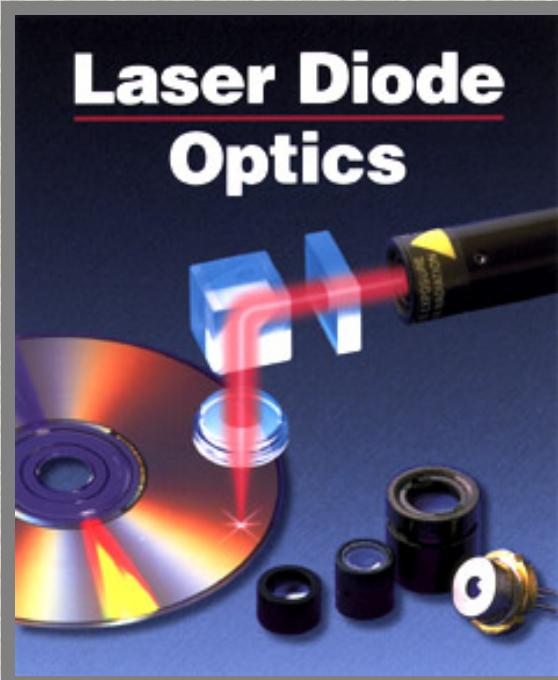
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<u>Laser Diodes</u>	<u>Laser Diode Mounting Kits</u>	 <u>Laser Diode Close-out List</u>	
<u>Laser Diode Optics</u>	<u>Glass Aspheric Lenses</u>	<u>Plastic Aspheric Lenses</u>	<u>Multi-element Lenses</u>
<u>Diode Laser Modules</u>	<u>OEM Diode Laser Modules</u>	<u>Collimated Diode Lasers</u>	<u>Optical Power Meter</u>
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[Glossary and Application Notes](#)

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New Mitsubishi Laser Diodes



[Mitsubishi 35mW 658nm Laser Diode -- ML1016R -- Ø5.6mm package](#)



[Mitsubishi 35mW 685nm Laser Diode -- ML1012R -- Ø5.6mm package](#)



[Mitsubishi 50mW 785nm Laser Diode -- ML64114R -- Ø9mm package](#)

New Sanyo Laser Diodes



[Sanyo 20mW 635nm Laser Diode -- DL4038-025 -- Ø9mm package](#)



[Sanyo 70mW 785nm Laser Diode -- DL7040-201 -- Ø5.6mm package](#)



[Sanyo 100mW 830nm Laser Diode -- DL 7032-001 -- Ø9mm package](#)



[Sanyo 150mW 830nm Laser Diode -- DL 8032-001 -- Ø9mm package](#)

Ophir PD 200 Optical Power Meter



[New Low Price Includes Photodiode Sensor with Two Calibrated Wavelengths](#)

Diode Laser Modules



[Diode Laser Modules for OEM Applications -- Low Cost 635nm and 650nm](#)

Laser Diode Optics and Components



[NEW LENS — 4mm FL, 0.50 NA Molded Glass Asphere for Laser Diodes](#)

[Laser Diode Collimating and Objective Lenses](#)

[Multi-element Spherical Glass Lenses](#)

[Single element Molded Glass Aspheric Lenses](#)

[Injection Molded Plastic Aspheric Lenses](#)

[Achromats, Doublets, Singlets, Mirrors, Beamsplitters etc...](#)

[Laser Diode Mounting Kits](#)

Convenient laser diode mounting systems for 5.6 mm or 9 mm diodes, a variety of lens options for collimating or focusing the laser diode and several mechanical configurations available...

New mounting kits not shown in the Optima printed catalog are described here:

[LDM 1100 KIT](#) -- laser diode mount attaches to a standard optical bench post...

[ADP 9056 KIT](#) -- optics package for use with LDM 1100 KIT, includes 3 lenses...

[LDM 3400 KIT](#) -- with 6 different interchangeable apertures for beam shaping...

[LDM 4100 KIT](#) -- molded glass aspheric lens with 3 axis lens adjustment...

[LDM 4200 KIT](#) -- an extra long focal length lens with a 0.14 NA...

[LDM 4500 KIT](#) -- a short focal length lens provides a smaller collimated beam...

Collimated Diode Lasers

A laser diode and collimating lens pre-assembled into a compact cylindrical housing, the laser diode is collimated or focused to a specified distance

Anamorphic Prisms

Used for laser diode beam shaping (i.e. to circularize a laser diodes elliptical beam)

Visible and Near-Infrared Diode Laser Modules

With optical power starting at 1mW and available up to 50mW, operating in the visible range from 635nm to 685nm and near-infrared wavelength of 780nm.



[Diode Laser Modules for OEM Applications -- Low Cost 635nm and 650nm](#)

Line Generating Modules and Aspheric Line Generating Lenses

2-Axis and 4-Axis Precision Positioners

A unique mechanical component used to accurately position optics and optoelectronic components. Very compact and economical, ideally suited for use with lasers diodes, modules and fibers...

Technical Information / Application Notes

Company Profile:

Optima Precision manufactures high-quality optics, specialized mechanical components, and instruments for use with laser diodes. Optima also supplies [laser diodes](#) from many of the leading manufacturers i.e. [Mitsubishi](#) – [Sanyo](#) – [Sony](#) [Toshiba](#)

Offering both [aspheric](#) and [multi-element lenses](#), Optima lenses are specifically designed for collimating or focusing laser diodes. Lenses are available in either glass or plastic materials with a wide selection of focal lengths, numerical apertures, and mounting configurations. Cost effective for both OEM applications and/or R&D.

Several different [laser diode mounting kits](#) are offered – these mounting systems provide an essential heatsink for the standard Ø5.6mm and Ø9mm laser diode and use Optima's proprietary laser diode optics. The [LDM 3400 KIT](#) has interchangeable apertures for beam shaping.

[Precision Positioners](#) – A unique mechanical component used to accurately position optics and optoelectronic components. Very compact and economical, ideally suited for use with lasers diodes, modules and fibers...

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Laser Diode Mounting Kits



If your work involves laser diodes, you'll appreciate the benefits of Optima's laser diode mounting systems.

Components in the system facilitate mounting a laser diode, collimating or focusing the beam, and aligning the beam with other optics or electro-optical components. Optima's laser diode mounting kits offer a quick and cost effective solution for mounting a Ø5.6mm or Ø9mm laser diode. All of the mounting kits (except the LDM 1100) include the collimating lens, a black anodized aluminum housing, and the hardware required to mount your laser (the laser diode is not included). All of the collimating lenses are intended for use with laser diodes in the 635nm to 830nm range.



[LDMKITS.PDF](#) (207K) Click on the file name to download an Adobe PDF file covering this section.

Laser Diode Mounting Kits For 5.6 mm and 9.0 mm Diameter Laser Diodes Model Comparison and Specifications:

Part Number	Price Each	Features and Attributes	X-Y Adjust	Collimating Lens Type	Collimating Lens P/N	Laser Diode Base Dimensions	Housing Dimensions	Collimated Beam Size (mm) note 5	Focused Beam Size (microns) note 5	Minimum Working Distance (mm)
LDM 1100 KIT	\$50.40	Optical bench mount, no optics	no	Optics not included, use ADP 9056 KIT listed below		Ø5.6 & 9.0mm	Ø25.3 x 10.4mm		Optics not included, use ADP 9056 KIT listed below	
ADP 9056 KIT ^(1,4)	\$130.00	Optics kit for LDM 1100 KIT	no	Lenses noted below (4) no laser diode mount included use LDM 1100 KIT (above)		Ø5.6 & 9.0mm	Ø25.3 x 14.9mm		Specifications vary with the different optics included with this kit	

Laser Diode Mounting Kits, Heatsink and Collimating Lens Holder - Optima

LDM 3300 KIT ⁽³⁾	\$54.60	Small collimated beam	no	Glass Asphere	305-0464-780	Ø5.6 & 9.0mm	Ø11 x 17mm	0.85 x 3.73	20 x 9.6	6 mm
LDM 3400 KIT ^(1,2)	\$74.00	Aperture for beam shaping	no	Multi-element	336-1027-xxx	Ø9.0mm	Ø12.7 x 18.5mm	Specifications vary with the different apertures included with this kit		
LDM 3456 KIT ^(1,2)	\$89.25	Interchangeable apertures for beam shaping	no	Multi-element	336-1027-xxx	Ø5.6mm	Ø12.7 x 18.5mm	Specifications vary with the different apertures included with this kit		
LDM 3500 KIT ⁽³⁾	\$69.30	Long FL lens for small beam at long distance	no	Glass Asphere	305-8040-780	Ø5.6 & 9.0m	Ø11 x 17mm	1.68 x 5.30	50 x 23	90 mm
LDM 3600 KIT ⁽¹⁾	\$89.25	Best beam quality	yes	Multi-element	336-1027-xxx	Ø9.0mm	Ø11 x 20.6mm	0.98 x 4.06	45 x 17	42 mm
LDM 3700 KIT ^(1,3)	\$67.20	Best beam quality	no	Multi-element	336-1027-xxx	Ø5.6 & 9.0mm	Ø11 x 17mm	0.98 x 4.06	27 x 21	16 mm
LDM 3800 KIT ^(1,3)	\$67.20	Best beam quality	no	Multi-element	336-1027-xxx	Ø5.6 & 9.0mm	Ø11 x 18mm			
LDM 3900 KIT ⁽³⁾	\$54.60	Good beam quality, smaller focused beam	no	Glass Asphere	305-0065-780	Ø5.6 & 9.0mm	Ø11 x 17mm	1.37 x 5.12	24 x 10.5	21 mm
LDM 4000 KIT ⁽³⁾	\$43.70	Lowest cost	no	Plastic asphere	300-0360-780	Ø5.6 & 9.0mm	Ø11 x 17mm	0.92 x 3.17	19.5 x 8.6	8 mm
LDM 4100 KIT	\$77.20	same as LDM 3900	yes	Glass Asphere	305-0065-780	Ø5.6 & 9.0mm	Ø11 x 17mm	1.37 x 5.12	45 x 18.5	45 mm
LDM 4200 KIT ⁽³⁾	\$50.40	Low cost, long FL lens for smallest beam at long distance	no	Plastic asphere	300-0395-780	Ø5.6 & 9.0mm	Ø11 x 25.5mm	3.38 x 4.65	51 x 36.1	153 mm

LDM 4500 KIT ⁽³⁾	\$43.70	Low cost, small collimated beam	no	Plastic asphere	300-0380-780	Ø5.6 & 9.0mm	Ø11 x 17mm	0.74 x 2.89	26.5 x 7.3	4 mm	
LDM 5000 KIT	\$278.00	Excellent beam quality, large diameter collimated beam	yes	Multi-element	336-0395-780	Ø9.0mm	Ø25.4 x 27mm	1.52 x 5.71	30 x 15.5	12 mm	

Notes:

- 1) Please specify collimating lens 336-1027-660 (for visible diodes) or 336-1027-785 (for near-infrared diodes).
- 2) The LDM 3400 and LDM 3456 KIT's include one aperture; the LDM 3406 and LDM 3457 include six interchangeable apertures.
- 3) These kits are also available for Ø5.6mm laser diodes – the P/N changes to LDM 3356, 3556, 3756, 3856, 3956, 4056, 4256, and 4556.
- 4) The ADP 9056 KIT must be used with the LDM 1100 KIT. The ADP 9056 KIT includes the lens housing for both Ø5.6mm and Ø9.0mm laser diodes, mounting hardware, and three collimating lenses: Part numbers 336-1027-660 or 336-1027-785; 305-0065-780; and 305-8040-780.
- 5) The reference data listed for a collimated and/or focused beam size is only intended as a "typical" example based on a Hitachi laser diode p/n HL6312G, operating at 2mW. The data was measured using a Photon Model 1180 BeamScan with a large aperture head for the collimated beam and a high resolution head for the focused beam measurements. The data will likely be different when another laser diode is measured and/or the operating power is changed.

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LDM 1100 KIT – Laser Diode Mount for Ø5.6mm and Ø9.0mm Diodes

The LDM 1100 Laser Diode Mount is shown below in the left frame. This convenient mount facilitates mounting the popular Ø5.6mm and Ø9.0mm laser diodes on a standard optical bench post with a #8-32 thread (the post is not included in the kit).

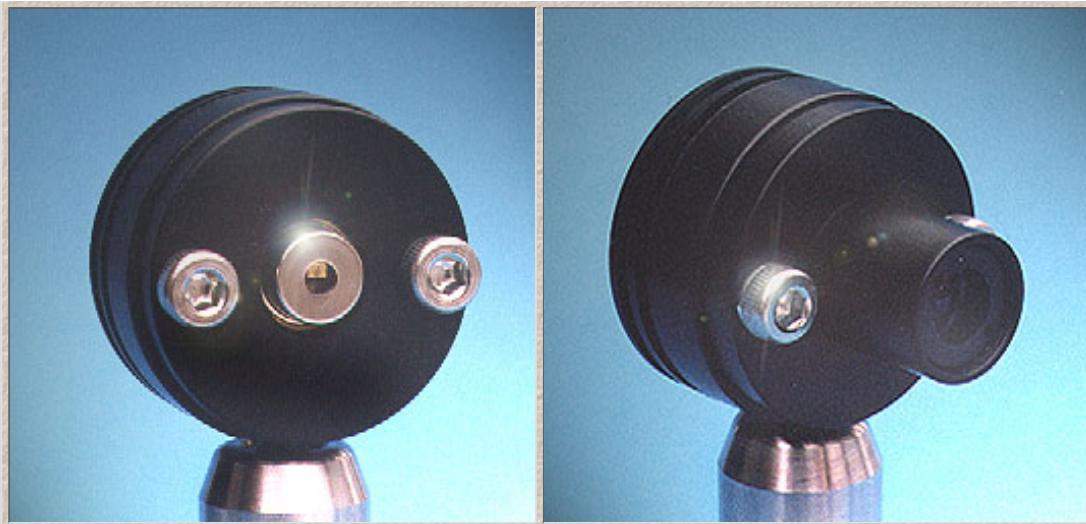
Often when we're working in the lab with various laser diodes and evaluating different optical assemblies, we find it very desirable to have the diode mounted in a heat sink/mount that provides direct access to the front of the diode. With unobstructed access to the diode's output, it's possible to position lenses or other optical components using a separate component holder and/or translation stage. Using the LDM 1100, the diode's base is firmly clamped against the heat sink surface and the diode's pins are accessible from the back side of the mount. A clearance hole on the back side of the mount permits using our laser diode socket ([P/N 900-8060-000](#)) which greatly improves reliability in connecting the diode with a drive cable.

Note: The LDM 1100 KIT includes the heat sink/mount and mounting hardware for both Ø5.6mm and Ø9.0mm laser diodes. There are no optics included in the LDM 1100 KIT — the ADP 9056 Optics Kit shown below in the right frame is designed to be used with the LDM 1100 — the ADP 9056 is described in the following section and should be ordered with the LDM 1100 KIT.

P/N LDM 1100 KIT ... Unit price (Qty 1- 4) \$50.40 each

[LDM 1100 KIT](#)

[ADP 9056 KIT](#)



ADP 9056 KIT - Optics for LDM 1100 KIT

The ADP 9056 is shown above in the right frame. This kit is specifically designed to compliment the LDM 1100 diode mount described above. Each kit includes two optics holders; one for use with Ø5.6mm diodes and a second holder for Ø9.0mm laser diodes. These black anodized, aluminum holders clamp the laser diode to the laser diode mount/heatsink and provide the precision thread for mounting and adjusting the collimating lens. Three Optima collimating lens are supplied with each kit – the lens part numbers are listed in the table below with a brief listing of the specifications – (the part numbers in the table are hypertext links to the detailed specifications page). These high quality collimating lenses provide the user with a practical range of focal lengths for many experiments with laser diodes ranging from 635nm to 830nm.

The ADP 9056 KIT includes the lens housing for both Ø5.6mm and Ø9.0mm laser diodes, mounting hardware, and three collimating lenses; part numbers [336-1027-660](#) or [336-1027-785](#); [305-0065-780](#); and [305-8040-780](#). The lens specifications are briefly listed below:

P/N ADP 9056 KIT ... Unit price (Qty 1- 4) \$130.00 each

ADP 9056 Optics Kit Lens Specifications:

Part Number	Type	Focal Length	Numerical Aperture	Clear Aperture	F#	Field Diameter
336-1027-660 or 336-1027-785 **	Multi-element Glass	4.516 mm	0.48	4.30 mm	1.05	0.156 mm
305-0065-780	Molded Glass Asphere	5.25 mm	0.40	5.00 mm	1.25	0.100 mm
305-8040-780		8.00 mm	0.30	4.80 mm	1.67	0.100 mm

** The ADP 9056 KIT may also be special ordered with the 336-1027-140 lens which is AR coated for use with 1300 nm and 1550 nm laser diodes, please contact the factory for pricing and availability.

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LDM 3300 KIT – Glass Asphere Lens with Large NA and Small Collimated Beam

The LDM 3300 KIT is the newest addition to Optima's Laser Diode Mounting System. The compact cylindrical housing provides the essential heat sink for the laser diode and a fine-pitch thread for adjusting the collimating lens position in the z-axis – allowing the user to either collimate or focus the laser diode beam.

The collimating lens used in the LDM 3300 kit is a diffraction limited, molded glass asphere with a large numerical aperture, Optima P/N [305-0464-780](#). With an NA of 0.5 the collimating lens will efficiently couple the output from most laser diodes. Also, this lens has a focal length that's slightly shorter than most of the Optima glass lenses – with a 4mm focal length, this lens creates a smaller collimated beam.

The minimum working distance is approximately 6 mm from the front surface of the LDM housing. Using a Hitachi HL6312G laser diode as an example, a beam focused at the minimum working distance is approximately 20 x 9.6 microns (1/e2, with 20 microns being the parallel axis); a collimated beam 100 mm from the front surface of the housing is ~0.85 mm x 3.73 mm.

When ordering this mounting kit for use with Ø5.6mm diodes, the part number changes to LDM 3356 KIT.

P/N LDM 3300 KIT ... Unit price (Qty 1- 4) \$54.60 each

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LDM 3400 KIT – Interchangeable Apertures to Circularize an Elliptical Beam

The LDM 3400 Laser Diode Mount is a unique design with a few features not found in the other Optima laser diode mounts. The 1/2-inch diameter cylindrical housing is essentially split into two sections; the back section holds the laser diode and the collimating lens. The front section holds a changeable aperture and provides the adjustment mechanism for positioning the collimating lens. The front section has a diamond knurl pattern on the outside diameter – to adjust the collimating lens position, just rotate the front section and the collimating lens moves precisely in the z-axis. The laser diode is firmly held in place by a threaded ring that sits on the back surface of the diode – increasing the metal-to-metal contact area and improving heat transfer.

Multi-element collimating lens – The lens included with the LDM 3400 mount is the Optima P/N 336-1027-660 or 336-1027-785*. This is possibly one of the best general purpose collimating lens ever designed for visible and near-infrared diodes. When combined with the LDM 3400 mount, the assembly is simple and lens adjustment provides exceptional control. Please refer to the [lens specifications](#) page for detailed information.

Interchangeable apertures – One technique used to “cleanup” or “circularize” a laser diodes elliptical beam is to pass the collimated beam through a small circular aperture. If the size of the aperture is small enough, the beam exiting the aperture will be circular – an obvious problem with this technique is a loss in optical power. However, most applications don't require a perfectly circular beam – somewhere between the diodes elliptical beam and a circular beam, there's usually an acceptable solution.

Comparison of LDM 3400 KIT using the 4.83mm (largest) aperture and the 1.14mm (smallest) aperture:

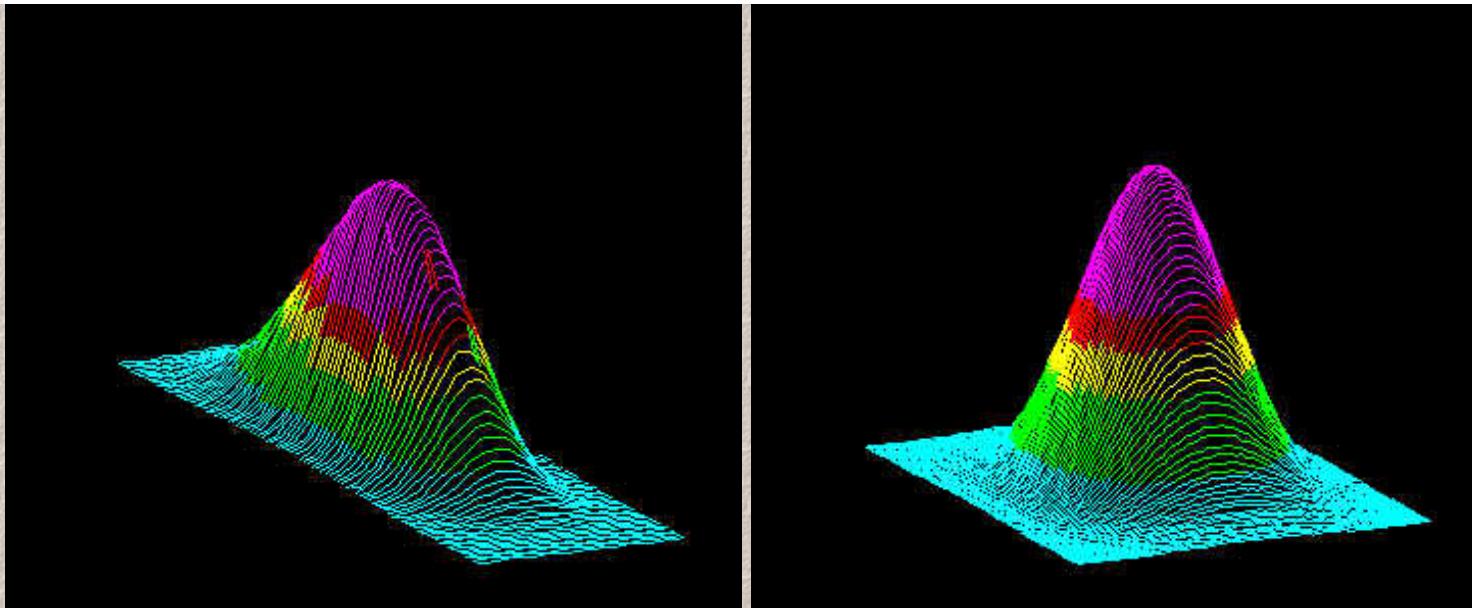


Figure 1
Focused beam 56.8 x 15.9 microns
Aspect ratio of ~3.5 to 1

Figure 2
Focused beam 66.0 x 51.6 microns
Aspect ratio of ~1.3 to 1

The two 3D figures shown above graphically illustrate the difference between an elliptical beam from a typical laser diode and a beam which has passed through a small aperture – effectively circularizing the beam. The laser diode used in these examples is the Hitachi HL6312G. The beam shown in figure 1 was collimated using the LDM 3400 KIT with the 4.83mm aperture installed. (The 4.83mm aperture has no effect on the beam as it is larger than the clear aperture of the collimating lens). The beam in figure 2 was collimated using the LDM 3400 KIT with the 1.14mm aperture installed. Both of the collimated beams were focused on the target sensor using a plano-convex lens with a 60mm focal length. The size of the focused spot in figure 1 is 56.8 x 15.9 microns with an aspect ratio of about 3.5:1. The size of the focused spot in figure 2 is 66.0 x 51.6 microns with an aspect ratio of about 1.3:1. (The figures are taken at the 1/e² point and are listed as the parallel axis x perpendicular axis).

Two additional points should be noted: When the beam is circularized with a small aperture, the focused spot will be larger than the focused spot which has not been clipped by an aperture. And with the larger diameter focused beam, the depth of field will increase. For a smaller focused beam consider the [LDM 4200 KIT](#) listed below.

The LDM 3406 KIT and the LDM 3457 KIT includes 6 circular apertures in the following sizes – 1.14, 1.52, 2.03, 2.54, 3.05, and 4.83mm. The 4.83mm aperture is larger than the clear aperture of the collimating lens, and consequently, has no clipping effect on the beam. The smallest aperture (1.14mm) is approximately equal to the dimension of the collimated beam in the parallel axis (the minor axis of the elliptical beam). When the smallest aperture is imposed on the collimated beam, the output beam will be very close to circular (this depends on the diodes parallel axis divergence angle). The loss in power, as compared with the 4.83mm aperture, is approximately 50%. The larger diameter apertures may be used to cleanup a beam by removing side lobes and other artifacts without causing a significant loss in power. In any case, the range of aperture sizes supplied with the LDM 3406 kit allows the user to evaluate the tradeoffs between beam size and power loss. The LDM 3406 KIT is for use with 9mm diameter diodes; the LDM 3457 KIT is for use with 5.6mm diodes.

Ready for Production – The LDM 3400 KIT and the LDM 3456 KIT includes one aperture – once you have determined the optimum size for the aperture, the kit is available in a lower cost production version with only one aperture. Special aperture sizes are available in production quantities; please contact the factory for a quote. The LDM 3400 KIT is for use with 9mm diameter diodes; the LDM 3456 KIT is for use with 5.6mm diodes.

P/N LDM 3400/3456 KIT ... Unit price (Qty 1- 4) \$74.00 each (Kit includes the collimating lens)

P/N LDM 3406/3457 KIT ** ... Unit price (Qty 1- 4) \$89.25 each (Kit includes the collimating lens and six apertures)

* The LDM 3400 or 3406 KIT may also be special ordered with the 336-1027-140 lens which is AR coated for use with 1300 nm to 1550 nm laser diodes; please contact the factory for pricing and availability.

** The LDM 3406 KIT has the same specifications as the LDM 3400 KIT and includes 6 apertures, the aperture sizes are listed in the product description above.

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LDM 3500 KIT – Smaller Beam for Long Distance Applications

The LDM 3500 KIT is similar to other laser diode mounts in the Optima product line – the housing provides a heat sink for the laser diode and a fine-pitch thread for adjusting the collimating lens position in the z-axis – allowing the user to either collimate or focus the laser diode beam.

However, the collimating lens included in the LDM 3500 kit is a very high quality molded glass asphere with a long focal of 8mm, Optima P/N [305-8040-780](#). This lens creates a very good quality beam in applications where a smaller beam is required at longer distances. It can be used in bar code readers that need a longer depth-of-field and/or work at greater stand-off distances than the typical hand-held device. It's probably most useful in alignment systems and laser levels that project a beam in excess of a hundred feet.

The minimum working distance is approximately 90 mm from the front surface of the LDM housing. Using a Hitachi HL6312G laser diode as an example, a beam focused at the minimum working distance is approximately 50 x 23 microns (1/e2, with 50 microns being the parallel axis); a collimated beam 100 mm from the front surface of the housing is ~1.68 mm x 5.30 mm.

When ordering this mounting kit for use with Ø5.6mm diodes, the part number changes to LDM 3556 KIT.

P/N LDM 3500 KIT ... Unit price (Qty 1- 4) \$69.30 each

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LDM 3600 KIT – Provides X-Y Alignment for Accurate Beam Pointing

The compact cylindrical housing provides the essential heat sink for a Ø9mm laser diode and a precise three-axis adjustment system for positioning the collimating lens relative to the laser diode. During assembly, the lens is aligned in the x-y axis with the laser diode emission point and adjusted in the z-axis to collimate or focus the beam. The collimating lens included with this kit is a high quality, multi-element lens with a relatively large numerical aperture – Optima P/N 336-1027-660 for visible diodes, or the 336-1027-785 for near-infrared diodes. Please refer to the [lens specifications](#) page for detailed information.

The minimum working distance is approximately 42 mm from the front surface of the LDM housing. Using a Hitachi HL6312G laser diode as an example, a beam focused at the minimum working distance is approximately 45 x 17 microns (1/e2, with 45 microns being the parallel axis); a collimated beam 100 mm from the front surface of the housing is ~0.98 mm x 4.06 mm.

* The LDM 3600 KIT may also be special ordered with the 336-1027-140 lens which is AR coated for use with 1300 nm to 1550 nm laser diodes; please contact the factory for pricing and availability.

P/N LDM 3600 KIT ... Unit price (Qty 1- 4) \$89.25 each (Kit includes the collimating lens)

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LDM 3700 KIT and LDM 3800 KIT – Easy to Assemble without X-Y Alignment

Similar to the LDM 3600 except the lens is adjustable only in the z-axis, controlling the focus or collimation of the beam; there is no provision for moving the lens in the x-y axis. The collimating lens and laser diode are positioned to within 13 microns of the housing mechanical center line; however, due to misplacement of the laser die inside the laser diode package, the optical beam may not be coincident with the housing mechanical axis — typically, the worse case pointing error is less than 17.5 mrad.

The difference between the LDM 3700 KIT and LDM 3800 KIT is as follows: the mechanical details of the lens holder are slightly different and the LDM 3700 housing is 17mm in length, whereas the LDM 3800 housing is 18mm long. The same collimating lens is included with either mounting kit; it's a high quality, multi-element lens with a relatively large numerical aperture – Optima P/N 336-1027-660* for visible diodes, or the 336-1027-785* for near-infrared diodes. Please refer to the [lens specifications](#) page for detailed information.

The minimum working distance is approximately 16 mm from the front surface of the LDM housing. Using a Hitachi HL6312G laser diode as an example, a beam focused at the minimum working distance is approximately 27 x 21 microns (1/e2, with 27 microns being the parallel axis); a collimated beam 100 mm from the front surface of the housing is ~0.98 mm x 4.06 mm.

When ordering a mounting kit for use with Ø5.6mm diodes, the part number changes to LDM 3756 KIT or LDM 3856 KIT.

Also, please specify which AR coating is required, -660 for visible diodes; or -785 for near-IR diodes.

* The LDM 3700 or 3800 KIT may also be special ordered with the 336-1027-140 lens which is AR coated for use with 1300 nm to 1550 nm laser diodes; please contact the factory for pricing and availability.

P/N LDM 3700 KIT ... Unit price (Qty 1- 4) \$67.20 each (Kit includes the collimating lens)

P/N LDM 3800 KIT ... Unit price (Qty 1- 4) \$67.20 each (Kit includes the collimating lens)

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LDM 3900 KIT – Molded Glass Aspheric Lens without X-Y alignment

Similar to the LDM 3700 except the collimating lens provided is a molded glass asphere – Optima P/N [305-0065-780](#). This kit provides an excellent compromise between cost and performance — something in between an assembly using the higher cost multi-element lens and a kit with a lower cost plastic lens. The optical performance of the lens is very good — it creates a collimated beam which is slightly larger than a beam from the 336-1027 lens, resulting in a beam with less divergence and, consequently, a smaller beam at greater distances. Conversely, due to the longer focal length and larger clear aperture, this lens creates a smaller focused beam. Please refer to the [lens specifications](#) page for detailed information.

The minimum working distance is approximately 21 mm from the front surface of the LDM housing. Using a Hitachi HL6312G laser diode as an example, a beam focused at the minimum working distance is approximately 24 x 10.5 microns (1/e2, with 24 microns being the parallel axis); a collimated beam 100 mm from the front surface of the housing is ~1.37 mm x 5.12 mm.

When ordering this mounting kit for use with Ø5.6mm diodes, the part number changes to LDM 3956 KIT.

P/N LDM 3900 KIT ... Unit price (Qty 1- 4) \$54.60 each (Kit includes the collimating lens)

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LDM 4000 KIT – Low Cost Plastic Bi-Aspheric Lens without X-Y Alignment

This low cost mounting kit is similar to the LDM 3900 except the collimating lens provided is an molded plastic asphere – Optima P/N 300-0360-780. Please refer to the [lens specifications](#) page for detailed information

The minimum working distance is approximately 8 mm from the front surface of the LDM housing. Using a Hitachi HL6312G laser diode, a beam focused at the minimum working distance is approximately 19.5×8.6 microns (1/e2, with 19.5 microns being the parallel axis); a collimated beam 100 mm from the front surface of the housing is ~ 0.92 mm x 3.17 mm.

When ordering this mounting kit for use with Ø5.6mm diodes, the part number changes to LDM 4056 KIT.

P/N LDM 4000 KIT ... Unit price (Qty 1- 4) \$43.70 each (Kit includes the collimating lens)

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LDM 4100 KIT – Molded Glass Aspheric Lens with provision for X-Y alignment

The compact cylindrical housing provides the heat sink for the laser diode and a precise three-axis adjustment system for positioning the collimating lens relative to the laser diode. During assembly, the lens is aligned in the x-y axis with the laser diode emission point and adjusted in the z-axis to collimate or focus the beam. The collimating lens included with this kit is the Optima P/N 310-0065-780, (this lens has the same spec's as the 305-0065-780, except the 310- version is in a special mount intended for this diode mounting kit). While the collimating lens is AR coated for 780nm, the lens works very well with both visible and near-infrared diodes. Please refer to the [lens specifications](#) page for detailed information.

The minimum working distance is approximately 45 mm from the front surface of the LDM housing. Using a Hitachi HL6312G laser diode as an example, a beam focused at the minimum working distance is approximately 45×18.5 microns (1/e2, with 45 microns being the parallel axis); a collimated beam 100 mm from the front surface of the housing is ~ 1.37 mm x 5.12 mm.

The LDM 4100 KIT is only available for Ø9.0mm diodes.

P/N LDM 4100 KIT ... Unit price (Qty 1- 4) \$77.20 each (Kit includes the collimating lens)

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LDM 4200 KIT – Bi-aspHERIC Plastic Lens for Long Distance Applications

This laser diode mounting kit is specifically designed to accept the Optima 300-0395-780 plastic aspheric collimating lens. Due to the relatively long focal length of the collimating lens, the housing is longer than most of the Optima laser diode mounts. With a long focal length (16mm) and small numerical aperture (NA=.14) this lens creates a relatively large diameter beam that's more circular than the output from a typical laser diode collimating lens. Also, the 300-0395-780 lens is a very high-quality injection molded plastic lens – this lens has been used in digital laser communication systems which are extremely sensitive to lens aberrations and diffraction patterns that can be misread as data when a beam sweeps across a detector. The only negative aspect of the lens might be the small NA – the coupling efficiency (or total transmission) for most visible laser diodes is just under 50%. Please refer to the [lens specifications](#) page for detailed information.

Comparison of LDM 4200 KIT and the LDM 3700 KIT:

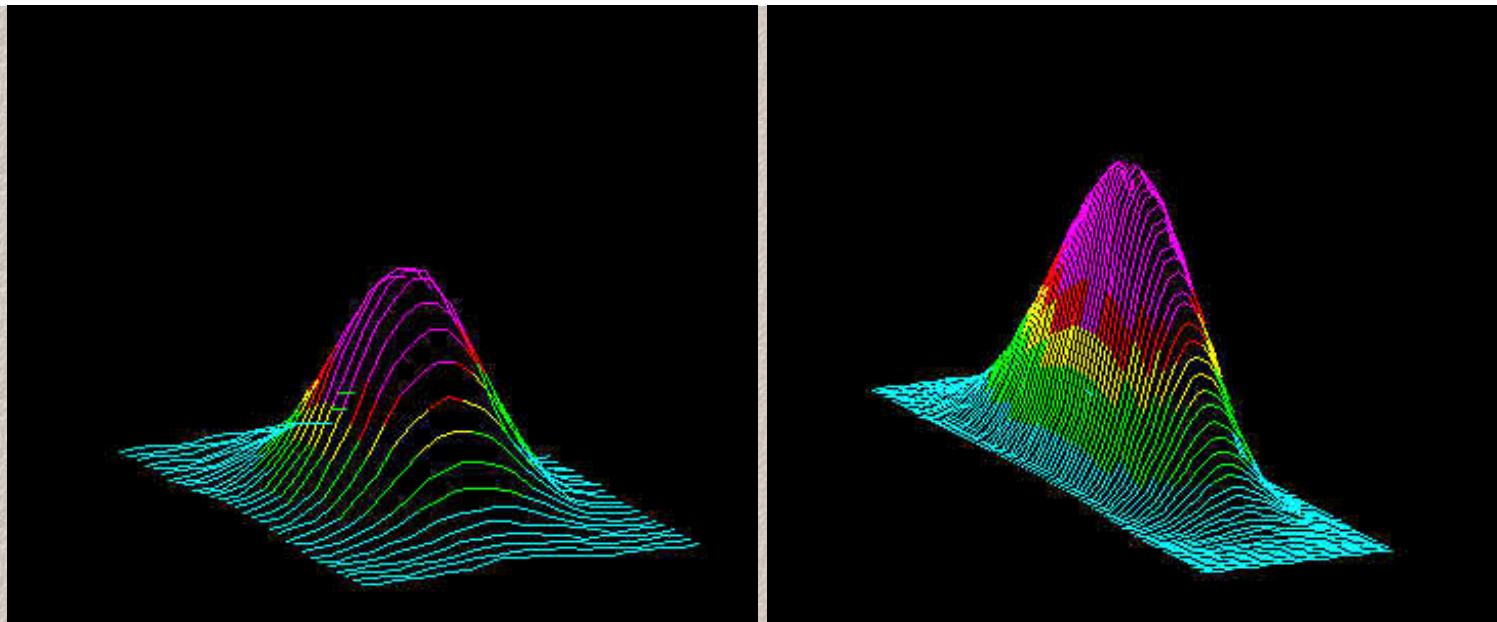


Figure 1 — LDM 4200 KIT
Focused beam 19.9 x 13.1 microns
Aspect ratio of ~1.5 to 1

Figure 2 — LDM 3700 KIT
Focused beam 54.8 x 15.2 microns
Aspect ratio of ~3.6 to 1

The two 3D figures shown above graphically illustrate the difference between a nearly circular beam from the LDM 4200 KIT and the typical elliptical beam, in this case from the LDM 3700 KIT. The laser diode used in these examples is the Hitachi HL6312G. The beam shown in figure 1 was collimated using the LDM 4200 KIT and the beam in figure 2 was collimated using the LDM 3700 KIT which is typical of all Optima LDM kits using the 336-1027-xxx collimating lens. Both of the collimated beams were focused on the target sensor using a plano-convex lens with a 60mm focal length. The size of the focused spot in figure 1 is 19.9 x 13.1 microns with an aspect ratio of about 1.5:1. The size of the focused spot in figure 2 is 54.8 x 15.2 microns with an aspect ratio of about 3.6:1. (The figures are taken at the 1/e² point and are listed as the parallel axis x perpendicular axis).

Due to the long focal length, the minimum working distance is approximately 153 mm (6 inches) from the front surface of the LDM housing. If the application requires focusing at shorter distances, it would be best to collimate the output from the diode and then use a simple lens like a plano-convex to focus the beam. However, for reference we have measured the beam from the LDM 4200 kit using a Hitachi HL6312G laser diode; a beam focused at the minimum working distance is approximately 51.0 x 36.1 microns (1/e², with 51.0 microns being the parallel axis); a collimated beam 100 mm from the front surface of the housing is ~3.38 mm x 4.65 mm.

When ordering this mounting kit for use with Ø5.6mm diodes, the part number changes to LDM 4256 KIT.

P/N LDM 4200 KIT ... Unit price (Qty 1- 4) \$50.40 each (Kit includes the collimating lens)

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LDM 4500 KIT – Low Cost Plastic Bi-Aspheric Lens, Small Collimated Beam

Similar to the LDM 4000 except the collimating lens provided is a molded plastic asphere, P/N 300-0380-780. With a short focal length of 3.4mm, this lens provides a relatively small collimated beam. A large numerical aperture (NA) of 0.47 provides excellent coupling efficiency with most laser diodes. Please refer to the [lens specifications](#) page for detailed information.

The minimum working distance is approximately 4 mm from the front surface of the LDM housing. Using a Hitachi HL6312G laser diode as an example, a beam focused at the minimum working distance is approximately 26.5 x 7.3 microns (1/e2, with 26.5 microns being the parallel axis); a collimated beam 100 mm from the front surface of the housing is ~0.74 mm x 2.89 mm.

When ordering this mounting kit for use with Ø5.6mm diodes, the part number changes to LDM 4556 KIT.

P/N LDM 4500 KIT ... Unit price (Qty 1- 4) \$43.70 each (Kit includes the collimating lens)

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LDM 5000 KIT – Low Wavefront Aberration, Larger Collimated Beam

Unique housing design – This housing has a flat mounting surface perpendicular to the optical axis, ideal for attachment to a printed circuit board or thermal electric cooler. Four #2-56 threaded holes in the base facilitate mounting, alignment, and aiming – if the base is attached to a “soft” mount like a rubber o-ring or wave washer, the beam can be “pointed” by selectively adjusting the four mounting screws attached to the base.

X-Y alignment – The laser emission point may be aligned with the lens optical axis by translating the diode in the x-y axis. While the lens is free to move in the z-axis (controlling focus or collimation) the lens does not rotate, minimizing lateral shift in the focused beam during the lens adjustment process. The collimating lens provided is a very high quality, diffraction-limited, multi-element lens with a large clear aperture and medium NA, Optima P/N 336-0965-780. With the larger clear aperture and excellent wavefront quality, this lens is intended for more demanding applications; such as laser diode instrumentation and/or long distance measurement applications. Please refer to the [lens specifications](#) page for detailed information.

Broad range of lens adjustment – The minimum working distance is approximately 12 mm from the front surface of the LDM housing. Using a Hitachi HL6312G laser diode as an example, a beam focused at the minimum working distance is approximately 30 x 15.5 microns (1/e2, with 30 microns being the parallel axis); a collimated beam 100 mm from the front surface of the housing is ~1.52 mm x 5.71 mm.

The LDM 5000 KIT is available in limited quantities and only for Ø9.0mm diodes.

P/N LDM 5000 KIT ... Unit price (Qty 1- 4) \$278.00 each (Kit includes the collimating lens)

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Last modified: December 30, 2000

Laser Diode Mounting Systems

or 5.6mm and 9mm Laser Diodes — Complete Mounting System with Collimating Lens

If your work involves laser diodes, you'll appreciate the benefits of Optima's laser diode mounting systems.

Components in the system facilitate mounting a laser diode, collimating or focusing the beam, and aligning the beam with other optics or electro-optical components. Optima's laser diode mounting kits offer a quick and cost effective solution for mounting a Ø5.6mm or Ø9mm laser diode. All of the mounting kits (except the LDM 1100) include the collimating lens, a black anodized aluminum housing, and the hardware required to mount your laser (the laser diode is not included). All of the collimating lenses are intended for use with laser diodes in the 635nm to 830nm range.

Model Comparison and Specifications:

PART NUMBER	FEATURES AND ATTRIBUTES	X-Y ADJUST	COLLIMATING LENS TYPE	COLLIMATING LENS P/N	LASER DIODE BASE DIMENSION	HOUSING DIMENSIONS	PRICE
LDM 1100 IT	Optical bench mount, no optics	no		Optics not included, use ADP 9056 KIT listed below	Ø5.6 & Ø9.0 mm	Ø25.3 x 10.4mm	\$50.40
DP 056 IT ^(1,4)	Optics kit for LDM 1100 KIT	no		Lenses noted below (4), no laser diode mount included use LDM 1100 KIT listed above	Ø5.6 & Ø9.0 mm	Ø25.3 x 14.9mm	130.00
LDM 3300 IT ⁽³⁾	Small collimated beam	no	Glass Asphere	305-0464-780	Ø5.6 & Ø9.0 mm	Ø11 x 17mm	54.60
LDM 3400 IT ^(1,2,3)	Aperture for beam shaping	no	Multi-element	336-1027-xxx	Ø5.6 & Ø9.0 mm	Ø12.7 x 18.5mm	74.00
LDM 3406 IT ^(1,2,3)	Interchangeable apertures for beam shaping	no	Multi-element	336-1027-xxx	Ø5.6 & Ø9.0 mm	Ø12.7 x 18.5mm	89.25
LDM 3500 IT ⁽³⁾	Long FL lens for small beam at long distance	no	Glass Asphere	305-8040-780	Ø5.6 & Ø9.0 mm	Ø11 x 18mm	69.30
LDM 3600 IT ⁽¹⁾	Best beam quality	yes	Multi-element	336-1027-xxx	Ø9.0 mm	Ø11 x 20.6mm	89.25
LDM 3900 IT ^(1,3)	Best beam quality	no	Multi-element	336-1027-xxx	Ø5.6 & Ø9.0 mm	Ø11 x 17mm	67.20
LDM 3800 IT ^(1,3)	Best beam quality	no	Multi-element	336-1027-xxx	Ø5.6 & Ø9.0 mm	Ø11 x 18mm	67.20
LDM 3900 IT ⁽³⁾	Good beam quality, smaller focused beam	no	Glass Asphere	305-0065-780	Ø5.6 & Ø9.0 mm	Ø11 x 17mm	54.60
LDM 4000 IT ⁽³⁾	Lowest cost	no	Plastic Asphere	300-0360-780	Ø5.6 & Ø9.0 mm	Ø11 x 17mm	43.70
LDM 4100 IT	same as LDM 3900	yes	Glass Asphere	305-0065-780	Ø9.0 mm	Ø11.87 x 20.6mm	77.20
LDM 4200 IT ⁽³⁾	Low cost, long FL lens for smallest beam at long distance	no	Plastic Asphere	300-0395-780	Ø5.6 & Ø9.0 mm	Ø11 x 25.5mm	50.40
LDM 4500 IT ⁽³⁾	Low cost, small collimated beam	no	Plastic Asphere	305-0380-780	Ø5.6 & Ø9.0 mm	Ø11 x 17mm	43.70
LDM 5000 IT	Excellent beam quality, large dia collimated beam	yes	Multi-element	336-0965-780	Ø9.0 mm	Ø25.4 x 27mm	278.00

Notes: 1)Please specify collimating lens 336-1027-660 (for visible diodes) or 336-1027-785 (for near-infrared diodes).

2) The LDM 3400 KIT includes one aperture; the LDM 3406 includes 6 interchangeable apertures.

3) These kits are also available for Ø5.6mm laser diodes – the P/N changes to LDM 3356, 3456, 3556, 3756, 3856, 3956, 4056, 4256, and 4556.

4) The ADP 9056 KIT must be used with the LDM 1100 KIT. The ADP 9056 KIT includes the lens housing for both Ø5.6mm and Ø9.0mm laser diodes, mounting hardware, and three collimating lenses: 336-1027-660 or 336-1027-785; 305-0065-780; and 305-8040-780.

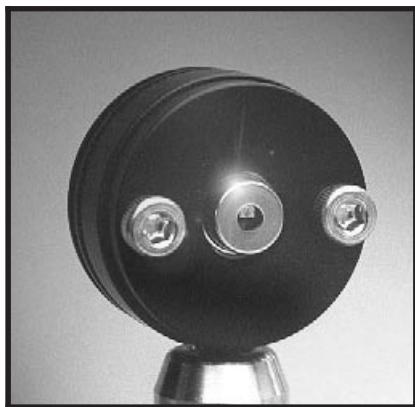
Laser Diode Mountin its Detailed Description and Specifications:

LDM 1100 IT Laser Diode Mount for 5.6mm and .0mm Diodes

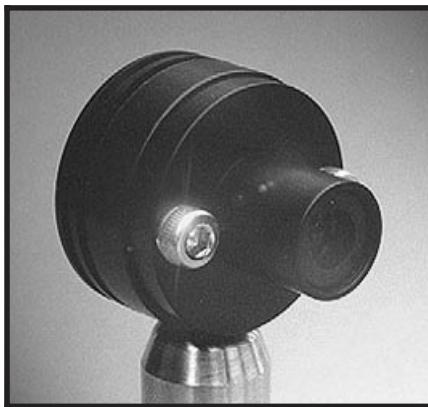
The LDM 1100 Laser Diode Mount is shown below in the left frame. This convenient mount facilitates mounting the popular Ø5.6mm and Ø9.0mm laser diodes on a standard optical bench post with a #8-32 thread (the post is not included in the kit).

Often when we're working in the lab with various laser diodes and evaluating different optical assemblies, we find it very desirable to have the diode mounted in a heat sink/mount that provides direct access to the front of the diode. With unobstructed access to the diode's output, it's possible to position lenses or other optical components using a separate component holder and/or translation stage. Using the LDM 1100, the diode's base is firmly clamped against the heat sink surface and the diode's pins are accessible from the back side of the mount. A clearance hole on the back side of the mount permits using our laser diode socket (P/N 900-8060-000) which greatly improves reliability in connecting the diode with a drive cable.

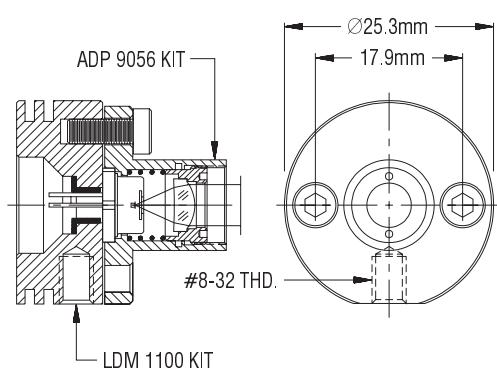
Note: The LDM 1100 IT includes the heat sink /mount and mounting hardware for both 5.6mm and .0mm laser diodes. There are no optics included in the LDM 1100 IT — the DP 056 Optics Kit shown below in the right frame is designed to be used with the LDM 1100 — the DP 056 is described in the next section and should be ordered with the LDM 1100 IT.



LDM 1100 KIT Laser Diode Mount



ADP 9056 KIT Optics Kit shown attached to the LDM 1100 Laser Diode Mount



Cross-section of the ADP 9056 KIT Optics Kit shown attached to the LDM 1100 Laser Diode Mount

DP 056 IT Optics Kit for LDM 1100 IT

The ADP 9056 is shown above in the right frame. This kit is specifically designed to compliment the LDM 1100 diode mount described above. Each kit includes two optics holders; one for use with Ø5.6mm diodes and a second holder for Ø9.0mm laser diodes. These black anodized, aluminum holders clamp the laser diode to the laser diode mount/heat sink and provide the precision thread for mounting and adjusting the collimating lens. Three Optima collimating lens are supplied with each kit — the lens part numbers are listed in the table below with a brief listing of the specifications. These high quality collimating lenses provide the user with a practical range of focal lengths for many experiments with laser diodes ranging from 635nm to 830nm.

The ADP 9056 KIT includes the lens housing for both Ø5.6mm and Ø9.0mm laser diodes, mounting hardware, and three collimating lenses; part numbers 336-1027-660 or -785; 305-0065-780; and 305-8040-780. The lens specifications are briefly listed below:

PART NUMBER	LENS TYPE	FOCAL LENGTH	NUMERICAL APERTURE	CLEAR APERTURE	FIELD DIAMETER	F#	CONJUGATE DISTANCE
336-10 -	Multi-element	4.516mm	0.476	4.30mm	0.156mm	1.05	Infinite
305-0065- 80	Molded Asphere	5.25mm	0.4	5.00mm	0.100mm	1.25	
305-8040- 80		8.00mm	0.3	4.80mm	0.100mm	1.67	

** The ADP 9056 KIT may also be special ordered with the 336-1027-140 lens which is AR coated for use with 1300 nm and 1550 nm laser diodes; please contact the factory for pricing and availability.

Laser Diode Mountin its Detailed Description and Specifications:

LDM 3300 IT lass sphere Lens with Lar e N and Small ollimated eam

The LDM 3300 KIT is the newest addition to Optima's Laser Diode Mounting System. The compact cylindrical housing provides the essential heat sink for the laser diode and a fine-pitch thread for adjusting the collimating lens position in the z-axis – allowing the user to either collimate or focus the laser diode beam.

The collimating lens used in the LDM 3300 kit is a diffraction limited, molded glass asphere with a large numerical aperture, Optima P/N 305-0464-780. With an NA of 0.5 the collimating lens will efficiently couple the output from most laser diodes. Also, this lens has a focal length that's slightly shorter than most of the Optima glass lenses – with a 4mm focal length, this lens creates a smaller collimated beam.

The minimum working distance is approximately 6 mm from the front surface of the LDM housing. Using a Hitachi HL6312G laser diode as an example, a beam focused at the minimum working distance is approximately 20×9.6 microns ($1/e^2$, with 20 microns being the parallel axis); a collimated beam 100 mm from the front surface of the housing is ~ 0.85 mm x 3.73 mm.

When ordering this mounting kit for use with Ø5.6mm diodes, the part number changes to LDM 3356 KIT.

LDM 3400 IT Interchan eable pertures to irculari e an lliptical eam

The LDM 3400 Laser Diode Mount is a unique design with a few features not found in the other Optima laser diode mounts. The 1/2-inch diameter cylindrical housing is essentially split into two sections; the back section holds the laser diode and the collimating lens. The front section holds a changeable aperture and provides the adjustment mechanism for positioning the collimating lens. The front section has a diamond knurl pattern on the outside diameter – to adjust the collimating lens position, just rotate the front section and the collimating lens moves precisely in the z-axis. The laser diode is firmly held in place by a threaded ring that sits on the back surface of the diode – increasing the metal-to-metal contact area and improving heat transfer.

Multi-element collimating lens – The lens included with the LDM 3400 mount is the Optima P/N 336-1027-660 or 336-1027-785*. This is possibly one of the best general purpose collimating lens ever designed for visible and near-infrared diodes. When combined with the LDM 3400 mount, the assembly is simple and lens adjustment provides exceptional control.

Interchan eable apertures – One technique used to “cleanup” or “circularize” a laser diodes elliptical beam is to pass the collimated beam through a small circular aperture. If the size of the aperture is small enough, the beam exiting the aperture will be circular – an obvious problem with this technique is a loss in optical power. However, most applications don't require a perfectly circular beam – somewhere between the diodes elliptical beam and a circular beam, there's usually an acceptable solution.

The LDM 3406 IT includes 6 circular apertures in the followin si es – 1.14, 1.52, 2.03, 2.54, 3.05, and 4.83mm. The 4.83mm aperture is larger than the clear aperture of the collimating lens, and consequently, has no clipping effect on the beam. The smallest aperture (1.14mm) is approximately equal to the dimension of the collimated beam in the parallel axis (the minor axis of the elliptical beam). When the smallest aperture is imposed on the collimated beam, the output beam will be very close to circular (this depends on the diodes parallel axis divergence angle). The loss in power, as compared with the 4.83mm aperture, is approximately 50%. The larger diameter apertures may be used to cleanup a beam by removing side lobes and other artifacts without causing a significant loss in power. In any case, the range of aperture sizes supplied with the LDM 3406 kit allows the user to evaluate the tradeoffs between beam size and power loss.

eady for Production – The LDM 3400 KIT includes one aperture – once you've determined the optimum size for the aperture, the kit is available in a lower cost production version with only one aperture. Special aperture sizes are available in production quantities; please contact the factory for a quote.

When ordering this mounting kit for use with Ø5.6mm diodes; the part number changes to LDM 3456 KIT or LDM 3457 KIT. The LDM 3456 KIT has one aperture; LDM 3457 KIT includes 6 apertures.

* The LDM 3400 Series kits may be special ordered with the 336-1027-140 lens which is AR coated for use with 1300 nm to 1550 nm laser diodes; please contact the factory for pricing and availability.

Laser Diode Mounting Kit Detailed Description and Specifications:

LDM 3500 KIT Smaller Beam for Longer Distance Applications

The LDM 3500 KIT is similar to other laser diode mounts in the Optima product line – the housing provides a heat sink for the laser diode and a fine-pitch thread for adjusting the collimating lens position in the z-axis – allowing the user to either collimate or focus the laser diode beam.

However, the collimating lens included in the LDM 3500 kit is a very high quality molded glass asphere with a long focal of 8mm, Optima P/N 305-8040-780. This lens creates a very good quality beam in applications where a smaller beam is required at longer distances. It can be used in bar code readers that need a longer depth-of-field and/or work at greater stand-off distances than the typical hand-held device. It's probably most useful in alignment systems and laser levels that project a beam in excess of a hundred feet.

The minimum working distance is approximately 90 mm from the front surface of the LDM housing. Using a Hitachi HL6312G laser diode as an example, a beam focused at the minimum working distance is approximately 50×23 microns ($1/e^2$, with 50 microns being the parallel axis); a collimated beam 100 mm from the front surface of the housing is ~ 1.68 mm x 5.30 mm.

When ordering this mounting kit for use with Ø5.6mm diodes, the part number changes to LDM 3556 KIT.

LDM 3600 KIT Provides Alignment for Accurate Beam Pointing

The compact cylindrical housing provides the essential heat sink for a Ø9mm laser diode and a precise three-axis adjustment system for positioning the collimating lens relative to the laser diode. During assembly, the lens is aligned in the x-y axis with the laser diode emission point and adjusted in the z-axis to collimate or focus the beam.

The collimating lens included with this kit is a high quality, multi-element lens with a relatively large numerical aperture – Optima P/N 336-1027-660 for visible diodes, or the 336-1027-785 for near-infrared diodes.

The minimum working distance is approximately 42 mm from the front surface of the LDM housing. Using a Hitachi HL6312G laser diode as an example, a beam focused at the minimum working distance is approximately 45×17 microns ($1/e^2$, with 45 microns being the parallel axis); a collimated beam 100 mm from the front surface of the housing is ~ 0.98 mm x 4.06 mm.

* The LDM 3600 KIT may also be special ordered with the 336-1027-140 lens which is AR coated for use with 1300 nm to 1550 nm laser diodes; please contact the factory for pricing and availability.

LDM 3700 KIT and LDM 3800 KIT Easy to Assemble without Alignment

Similar to the LDM 3600 except the lens is adjustable only in the z-axis, controlling the focus or collimation of the beam; there is no provision for moving the lens in the x-y axis. The collimating lens and laser diode are positioned to within 13 microns of the housing mechanical center line; however, due to misplacement of the laser die inside the laser diode package, the optical beam may not be coincident with the housing mechanical axis — typically, the worse case pointing error is less than 17.5 mrad.

The difference between the LDM 3700 KIT and LDM 3800 KIT is as follows: the mechanical details of the lens holder are slightly different and the LDM 3700 housing is 17mm in length, whereas the LDM 3800 housing is 18mm long. The same collimating lens is included with either mounting kit; it's a high quality, multi-element lens with a relatively large numerical aperture – Optima P/N 336-1027-660 for visible diodes, or the 336-1027-785 for near-infrared diodes.*

The minimum working distance is approximately 16 mm from the front surface of the LDM housing. Using a Hitachi HL6312G laser diode as an example, a beam focused at the minimum working distance is approximately 27×21 microns ($1/e^2$, with 27 microns being the parallel axis); a collimated beam 100 mm from the front surface of the housing is ~ 0.98 mm x 4.06 mm.

When ordering a mounting kit for use with Ø5.6mm diodes, the part number changes to LDM 3756 KIT or LDM 3856 KIT. Also, please specify which AR coating is required, -660 for visible diodes; or -785 for near-IR diodes.*

* The LDM 3700 or 3800 KIT may also be special ordered with the 336-1027-140 lens which is AR coated for use with 1300 nm to 1550 nm laser diodes; please contact the factory for pricing and availability.

Laser Diode Mountin its Detailed Description and Specifications:

LDM 3 00 IT Molded glass spheric Lens without - alignment

Similar to the LDM 3700 except the collimating lens provided is a molded glass asphere – Optima P/N 305-0065-780. This kit provides an excellent compromise between cost and performance — something in between an assembly using the higher cost multi-element lens and a kit with a lower cost plastic lens. The optical performance of the lens is very good — it creates a collimated beam which is slightly larger than a beam from the 336-1027 lens, resulting in a beam with less divergence and, consequently, a smaller beam at greater distances. Conversely, due to the longer focal length and larger clear aperture, this lens creates a smaller focused beam.

The minimum working distance is approximately 21 mm from the front surface of the LDM housing. Using a Hitachi HL6312G laser diode as an example, a beam focused at the minimum working distance is approximately 24×10.5 microns ($1/e^2$, with 24 microns being the parallel axis); a collimated beam 100 mm from the front surface of the housing is ~ 1.37 mm x 5.12 mm.

When ordering this mounting kit for use with Ø5.6mm diodes, the part number changes to LDM 3956 KIT.

LDM 4000 IT Low cost Plastic i- spheric Lens without - alignment

This low cost mounting kit is similar to the LDM 3900 except the collimating lens provided is an molded plastic asphere – Optima P/N 300-0360-780.

The minimum working distance is approximately 8 mm from the front surface of the LDM housing. Using a Hitachi HL6312G laser diode, a beam focused at the minimum working distance is approximately 19.5×8.6 microns ($1/e^2$, with 19.5 microns being the parallel axis); a collimated beam 100 mm from the front surface of the housing is ~ 0.92 mm x 3.17 mm.

When ordering this mounting kit for use with Ø5.6mm diodes, the part number changes to LDM 4056 KIT.

LDM 4100 IT Molded glass spheric Lens with provision for - alignment

The compact cylindrical housing provides the heat sink for the laser diode and a precise three-axis adjustment system for positioning the collimating lens relative to the laser diode. During assembly, the lens is aligned in the x-y axis with the laser diode emission point and adjusted in the z-axis to collimate or focus the beam. The collimating lens included with this kit is the Optima P/N 310-0065-780, (this lens has the same spec's as the 305-0065-780, except the 310-version is in a special mount intended for this diode mounting kit). While the collimating lens is AR coated for 780nm, the lens works very well with both visible and near-infrared diodes.

The minimum working distance is approximately 45 mm from the front surface of the LDM housing. Using a Hitachi HL6312G laser diode as an example, a beam focused at the minimum working distance is approximately 45×18.5 microns ($1/e^2$, with 45 microns being the parallel axis); a collimated beam 100 mm from the front surface of the housing is ~ 1.37 mm x 5.12 mm.

The LDM 4100 KIT is only available for Ø9.0mm diodes.

Laser Diode Mountin its Detailed Description and Specifications:

LDM 4 00 IT i-aspheric Plastic Lens for Lon Distance pplications

This laser diode mounting kit is specifically designed to accept the Optima 300-0395-780 plastic aspheric collimating lens. Due to the relatively long focal length of the collimating lens, the housing is longer than most of the Optima laser diode mounts. With a long focal length (16mm) and small numerical aperture (NA=.14) this lens creates a relatively large diameter beam that's more circular than the output from a typical laser diode collimating lens. Also, the 300-0395-780 lens is a very high-quality injection molded plastic lens – this lens has been used in digital laser communication systems which are extremely sensitive to lens aberrations and diffraction patterns that can be misread as data when a beam sweeps across a detector. The only negative aspect of the lens might be the small NA – the coupling efficiency (or total transmission) for most visible laser diodes is just under 50%.

Due to the long focal length, the minimum working distance is approximately 153 mm (6 inches) from the front surface of the LDM housing. If the application requires focusing at shorter distances, it would be best to collimate the output from the diode and then use a simple lens like a plano-convex to focus the beam. However, for reference we have measured the beam from the LDM 4200 kit using a Hitachi HL6312G laser diode; a beam focused at the minimum working distance is approximately 51.0 x 36.1 microns (1/e2, with 51.0 microns being the parallel axis); a collimated beam 100 mm from the front surface of the housing is ~3.38 mm x 4.65 mm.

When ordering this mounting kit for use with Ø5.6mm diodes, the part number changes to LDM 4256 KIT.

LDM 4500 IT Low ost Plastic i- spheric Lens, Small ollimated eam

Similar to the LDM 4000 except the collimating lens provided is a molded plastic asphere, P/N 300-0380-780. With a short focal length of 3.4mm, this lens provides a relatively small collimated beam. A large numerical aperture (NA) of 0.47 provides excellent coupling efficiency with most laser diodes.

The minimum working distance is approximately 4 mm from the front surface of the LDM housing. Using a Hitachi HL6312G laser diode as an example, a beam focused at the minimum working distance is approximately 26.5 x 7.3 microns (1/e2, with 26.5 microns being the parallel axis); a collimated beam 100 mm from the front surface of the housing is ~0.74 mm x 2.89 mm.

When ordering this mounting kit for use with Ø5.6mm diodes, the part number changes to LDM 4556 KIT.

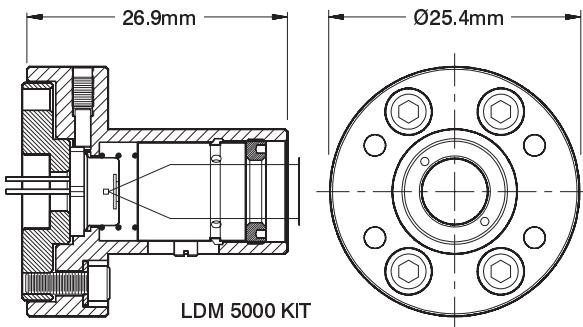
LDM 5000 IT Low Wavefront berration, Lar er ollimated eam

ni ue housin desin – This housing has a flat mounting surface perpendicular to the optical axis, ideal for attachment to a printed circuit board or thermal electric cooler. Four #2-56 threaded holes in the base facilitate mounting, alignment, and aiming – if the base is attached to a “soft” mount like a rubber o-ring or wave washer, the beam can be “pointed” by selectively adjusting the four mounting screws attached to the base.

- alinment – The laser emission point may be aligned with the lens optical axis by translating the diode in the x-y axis. While the lens is free to move in the z axis (controlling focus or collimation) the lens does not rotate, minimizing lateral shift in the focused beam during the lens adjustment process. The collimating lens provided is a very high quality, diffraction-limited, multi-element lens with a large clear aperture and medium NA, Optima P/N 336-0965-780. With the larger clear aperture and excellent wavefront quality, this lens is intended for more demanding applications; such as laser diode instrumentation and/or long distance measurement applications.

road ran e of lens ad ustment – The minimum working distance is approximately 12 mm from the front surface of the LDM housing. Using a Hitachi HL6312G laser diode as an example, a beam focused at the minimum working distance is approximately 30 x 15.5 microns (1/e2, with 30 microns being the parallel axis); a collimated beam 100 mm from the front surface of the housing is ~1.52 mm x 5.71 mm.

The LDM 5000 KIT is available in limited quantities and only for Ø9.0mm diodes.





Tools and Accessories

Laser Diode Socket – If you're looking for a reliable socket for a laser diode, this is undoubtedly the best socket available. The contacts are gold-plated beryllium copper and the body is injection molded Teflon. There are 3 contacts located on a 0.100" diameter circle which exactly matches the pin layout for the standard Ø9mm laser diode -- the sockets may also be used with the Ø5.6mm laser diodes by slightly bending the laser diode's leads. On the wire side of the socket, there are solder pots which accept up to 24 gauge wire. The physical size is Ø6.3mm x 10.3mm in length (Ø.248" x .405").

Part number	Description	Price each
900-8060-000	Laser Diode Socket, for three pin laser diodes	\$ 9.90

Lens Adjustment Tool – A miniature spanner wrench for adjusting the collimating lens in most Optima laser diode assemblies. The plastic ring has two steel pins which engage the lens holder allowing precise rotation and control of the lens assembly. The aperture through the tool is large enough to clear most collimated beams. (This tool isn't absolutely necessary to adjust the lens – almost any small pointed object will work – however, the tool provides better control over a very sensitive adjustment).

Part number	Description	Price each
900-3638-000	Focus Adjustment Tool, fits all lens holders except as mentioned below	\$ 12.10
900-5038-000	Focus Adjustment Tool, for LDM 5000 KIT	\$ 18.40

Retaining Ring Pliers – When the Optima Laser Diode Mounting kits are used in production applications, we recommend using a pair of high quality retaining ring pliers. This is a case where using the correct tool will really help make the assembly process easier. The pliers are forged-steel with cushioned hand grips and the tips are conveniently angled at 90 degrees for installing internal rings.

Part number	Description	Price each
900-3590-000	Retaining Ring Pliers, for 5/16" to 5/8" diameter rings	\$ 24.00

Precision Thread Tap – The thread used on many of the Optima lens holders is a .375-64 (3/8 inch diameter, 65 threads per inch). The fine pitch provides precise control for adjusting collimation or focus. While this thread is special, there are taps and dies available from many machine tool suppliers in the U.S. (however, you may not find it at your local hardware store). For your convenience, we stock the .375-64 tap (used for cutting internal threads).

Part number	Description	Price each
900-3864-000	Precision Thread Tap, .375-64	\$ 13.20

Miniature Hex Driver – The Optima Laser Diode Mounting kits that have an x-y adjustment are supplied with the appropriate hex key however, this miniature precision driver is recommended for adjusting the small #0-80 set screws in production applications.

Part number	Description	Price each
900-7270-080	Miniature Hex Driver for #0-80 set screws used on the LDM 3600 KIT, LDM 4100 KIT	\$ 8.90

Heat Sink Compound – To improve the heat transfer between a laser diode and the mounting surface or housing, we recommend using a small amount of non-silicone heat sink compound. This material is formulated to eliminate the phenomenon of silicone migration and out-gassing. The material will not harden, dry out or melt. It also meets the physical properties of MIL-C-47113.

Part number	Description	Price each
900-3626-000	Heat Sink Compound, Tube 4 oz.	\$ 21.20

Duco® Cement* – A long time favorite for use with optics. The adhesive bonds or tacks glass to metal, it dries quickly and can be removed or softened with acetone.

Part number	Description	Price each
900-4740-000	Adhesive, Tube 1 oz.	\$ 3.15

* Duco is a registered trademark of Devcon Corporation

Optical Bench Adapters – These four adapters are specifically designed to hold Optima's Diode Laser Modules, Collimated Diode Lasers, and Laser Diode Mounts. Machined from aluminum and finished with a black anodize, the adapters attach to a standard optical bench post with an #8-32 thread (the post is not included). The laser diode assembly is firmly retained in the adapter by a nylon-tipped set screw – a close fit between the laser diode assembly and the adapter facilitates heat transfer.

Part number	Description	Price each
ADP 1125-000	Holds an 11mm diameter Collimated Diode Laser (CDL) or the Ø11mm Laser Diode Mounting Kit (LDM) on a standard optical bench post using the #8-32 thread.	\$ 14.70
ADP 1525-000	Holds a 15m diameter Diode Laser Module (DLM) or Line Generator Module on a standard optical bench post using the #8-32 thread. Two holders may be used in an environment where vibration may be a problem.	\$ 14.70
ADP 1115-000	Holds an 11mm diameter Collimated Diode Laser (CDL) or the Ø11mm Laser Diode Mounting Kit (LDM) in the two-axis positioner (P/N 250-0015) or the four-axis positioner (P/N 260-0015)	\$ 13.20

ADP 1538-000	Lens holder for use with two-axis and four-axis positioners, this adapter has an internal 3/8-64 which fits many of the Optima mounted lenses i.e. 302-0355-780 , 302-0360-780 , 306-0065-780 , 306-8040-780 , and 306-1027-xxx	\$ 11.00
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Last modified: March 13, 2001



2-Axis and 4-Axis Precision Positioners



Precision XY Translator & XY Translator plus Tilt Control (shown above)

These unique XY Translators help reduce the tedious process of accurately positioning optics and optoelectronic components. Compared with a conventional translation stage, these units offer several advantages. In a very compact and economical package, the XY Translators provide smooth, precision movement in two axes.

Ideally suited for OEM or prototype use in optical instruments, the XY Translators facilitate the accurate positioning of light sources, optics, fibers, and detectors or sensors for maximum performance. While the positioners were designed for an optical instrument, we've found them indispensable in our optical bench set-ups where small optics and other critical devices must be carefully aligned. The small footprint of the XY Translators and their compatibility with standard optical bench post holders, allows the use of multiple units in the space typically required by one translation stage.

Precise x-y motion is controlled by moving a pair of levers on the side of the unit. One lever moves the optical component in the X direction while the second lever controls the Y axis movement. A positive locking mechanism ensures the mount will be permanently locked in place once the desired position is established.

Components are retained in the mount with a nylon-tipped set screw which gently, but positively, holds the component against two contact points, ensuring a stable three-point mounting system. Part number 250-0015 will accept components up to 15mm in diameter, while P/N 250-0025 accepts components up to 25.4mm in diameter. Additional hardware may be attached to the front surface of the mount by using the four #4-40 threaded holes. Two #8-32 threaded holes on the bottom edge of the mount are compatible with most standard optical bench posts.

XY Translator plus Tilt Adjustment

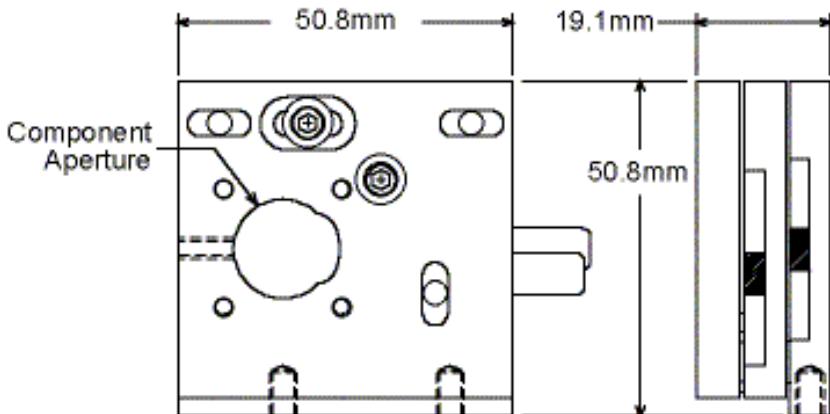
Precision control of angular adjustment is available in the four axis positioners. With the same basic operation as the XY Translators described above, the four axis unit provides the added capability of tilt control. Kinematic angular adjustment is achieved by using a pair of 1/4-80 adjustment screws while a pair of levers independently control the x-y movement. The kinematic adjustment screws may be ordered with either screwdriver adjustment slots or with rubber covered knobs for convenient tool-free adjustment.

Part Numbers and Specifications:

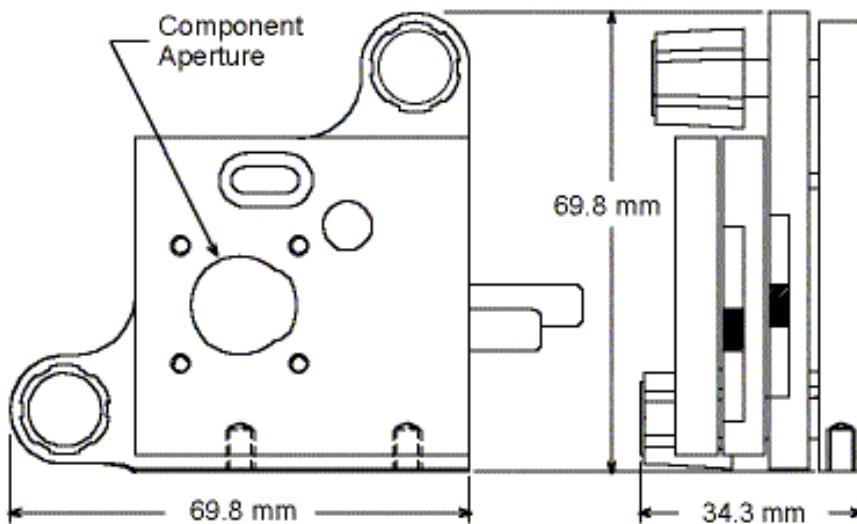
Description	X-Y Translator	
Part Number	250-0015-000	250-0025-000
Unit Price	\$183.75	\$183.75
Aperture Size (maximum component diameter)	15 mm (0.590 in.)	25.4 mm (1 in.)
Linear Range of Motion	± 2 mm (0.080 in.)	
Linear Adjustment Sensitivity		< 0.1 mm (0.004 in.)
Material and Finish	Aluminum, anodized black	

Mechanical Dimensions:

Precision XY Translator



XY Translator plus Tilt Adjustment



Description	X-Y Translator plus Tilt Adjustment
Part Number	260-0015-000
Unit Price	\$252.00
Aperture Size (maximum component diameter)	15 mm (0.590 in.)
Linear Range of Motion	± 2 mm (0.080 in.)
Linear Adjustment Sensitivity	< 0.1 mm (0.004 in.)
Angular Range of Motion	± 1.5° in both axis
Angular Adjustment Sensitivity	< 0.1 minute
Material and Finish	Aluminum, anodized black

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Last modified: December 30, 2000

Laser Diode Specifications - Sanyo DL4039-011

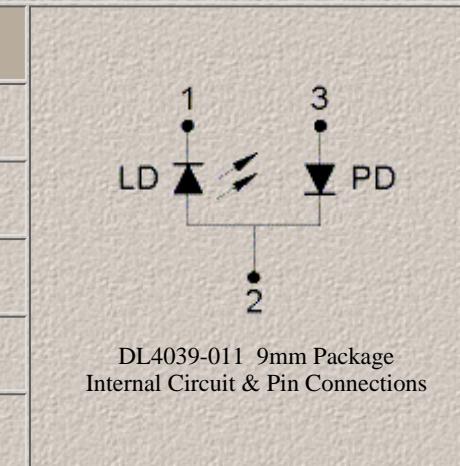


[DL403911.PDF](#) (83K) Click on the file name to download an Adobe PDF file covering this page.

675nm / 5mW / 9mm package

Absolute Maximum Ratings (Tc=25°C)

Characteristic	Symbol	Value	Unit
Optical output power	Po	10	mW
Laser diode reverse voltage	V _{R(LD)}	2	V
Photodiode reverse voltage	V _{R(PD)}	30	V
Operating temperature	T _{opr}	-10 to +50	°C
Storage temperature	T _{stg}	-40 to +85	°C



Optical and Electrical Characteristics (Tc=25°C)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	I _{th}	-	40	70	mA	-
Operating current	I _{op}	-	60	90	mA	Po=10mW
Lasing wavelength	λ _p	665	675	685	nm	Po=10mW
Beam divergence (parallel)	θ	6	8	10	deg	Po=10mW (FWHM)
Beam divergence (perpendicular)	θ _⊥	25	30	40	deg	Po=10mW (FWHM)
Differential efficiency	η	0.2	0.5	-	mW/mA	-
Monitor current	I _m	0.05	0.15	0.40	mA	Po=10mW
Astigmatism	A _s	-	8	-	microns	Po=10mW

Disclaimer: The laser diode information summarized above is based on the respective diode manufacturer's commercial catalog and/or data sheet specifications. The data is presumed to be accurate; however, it is subject to change without notice. Optima makes no representation as to the accuracy of the information and does not assume any responsibility for errors or omissions contained herein. The user must refer to the manufacturers specifications for details concerning the intended application and operation, diode limitations, and safety.

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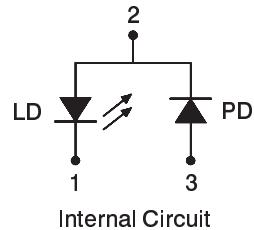
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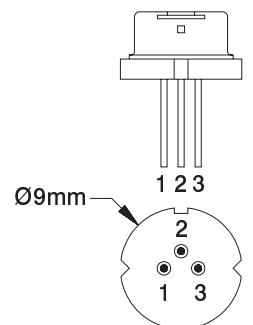
a o DL Laser Diode pe ifi a io s

The anyo DL 03-0 is an inde guided Aa nPlaser diode with a typical output of 6 0nm and a ma imum of 0m . The diode features low threshold current which is achieved by a strained multi-quantum well active layer. The DL 03-0 is suitable for applications including bar-code readers, laser pointers, and laser levels. The DL 03-0 has a Ø9mm pac age.



bsolute Ma imum atin s (Tc 5)

Characteristic	Symbol	Value	Unit
Optical output power	Po	10	mW
Laser diode reverse voltage	VR(LD)	2	V
Photodiode reverse voltage	VR(PD)	30	V
Operating temperature	Topr	– 10 to + 50	°C
Storage temperature	Tstg	– 40 to + 85	°C



Package Type: Ø9mm

Operatin and lectrical haracteristics (Tc 5)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	Ith	–	40	70	mA	–
Operating current	Iop	–	60	90	mA	Po=10mW
Lasing Wavelength	λp	665	675	685	nm	Po=10mW
Beam divergence (parallel)	θ //	6	8	10	deg	Po=10mW, (FWHM)
Beam divergence (perpendicular)	θ ⊥	25	30	40	deg	Po=10mW, (FWHM)
Differential efficiency	η	0.2	0.5	–	mW/mA	–
Monitor current	Im	0.05	0.15	0.4	mA	Po=10mW
Astigmatism	As	–	8	–	microns	Po=10mW

Disclaimer: The laser diode information summarized above is based on the respective diode manufacturer's commercial catalog and/or data sheet specifications. The data is presumed to be accurate; however, it is subject to change without notice. Optima makes no representation as to the accuracy of the information and does not assume any responsibility for errors or omissions contained herein. The user must refer to the manufacturers specifications for details concerning the intended application and operation, diode limitations, and safety.

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Laser Diode Specifications - Sanyo DL3147-261

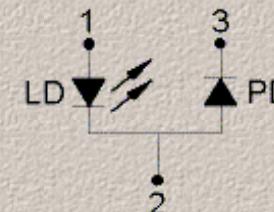


[DL314761.PDF](#) (84K) Click on the file name to download an Adobe PDF file covering this page.

645nm / 7mW / 5.6mm package

Absolute Maximum Ratings (Tc=25°C)

Characteristic	Symbol	Value	Unit
Optical output power	Po	7	mW
Laser diode reverse voltage	V _{R(LD)}	2	V
Photodiode reverse voltage	V _{R(PD)}	30	V
Operating temperature	T _{opr}	-10 to +70	°C
Storage temperature	T _{stg}	-40 to +85	°C



DL3147-261 5.6mm Package
Internal Circuit & Pin Connections

Optical and Electrical Characteristics (Tc=25°C)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	I _{th}	-	45	60	mA	-
Operating current	I _{op}	-	60	80	mA	Po=5mW
Operating voltage	V _{op}	-	2.2	2.5	V	Po=5mW
Lasing wavelength	λ _p	-	645	660	nm	Po=5mW
Beam divergence (parallel)	θ //	6	7.5	10	deg	Po=5mW (FWHM)
Beam divergence (perpendicular)	θ ⊥	25	30	40	deg	Po=5mW (FWHM)
Differential efficiency	η	0.15	0.35	-	mW/mA	-
Monitor current	I _m	0.05	0.15	0.5	mA	Po=5mW
Astigmatism	A _s	-	8	-	microns	Po=5mW

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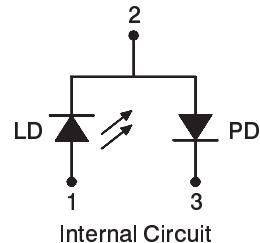
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a o DL 2

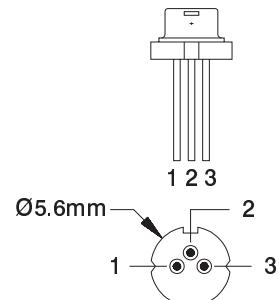
Laser Diode pe ifi a io s

The anyo DL3 - 6 is an inde guided Aa nPlaser diode with a typical output of 6.5nm. The diode features low threshold current and an extended operating temperature which is achieved by a strained multi-quantum well active layer. The DL3 - 6 is suitable for applications including optical disc systems, DVD-O and similar optical storage products. The DL3 - 6 has a Ø5.6mm package.



Absolute Maximum Ratings (Tc = 5 °C)

Characteristic	Symbol	Value	Unit
Optical output power	Po	7	mW
Laser diode reverse voltage	VR(LD)	2	V
Photodiode reverse voltage	VR(PD)	30	V
Operating temperature	Topr	-10 to +70	°C
Storage temperature	Tstg	-40 to +85	°C



Package Type: Ø5.6mm

Operating and Electrical Characteristics (Tc = 5 °C)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	Ith	—	45	65	mA	CW
Operating current	Iop	—	60	80	mA	Po=5mW
Operating voltage	Vop	—	2.2	2.5	V	Po=5mW
Lasing Wavelength	λp	—	645	660	nm	Po=5mW
Beam divergence (parallel)	θ//	6	7.5	10	deg	Po=5mW, (FWHM)
Beam divergence (perpendicular)	θ⊥	25	30	40	deg	Po=5mW, (FWHM)
Differential efficiency	η	0.15	0.35	—	mW/mA	—
Monitor current	Im	0.05	0.15	0.5	mA	Po=5mW
Astigmatism	As	—	8	—	microns	Po=5mW

Disclaimer: The laser diode information summarized above is based on the respective diode manufacturer's commercial catalog and/or data sheet specifications. The data is presumed to be accurate; however, it is subject to change without notice. Optima makes no representation as to the accuracy of the information and does not assume any responsibility for errors or omissions contained herein. The user must refer to the manufacturers specifications for details concerning the intended application and operation, diode limitations, and safety.

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Laser Diode Specifications

Optima is no longer recommending, selling, or supporting Hitachi laser diodes.

All Hitachi laser diode specifications have been removed from the Optima website.

Possible substitute part: [Mitsubishi ML1012R](#) or [Mitsubishi ML1013R](#)

Detailed specifications and pricing for laser diodes from other manufacturers are listed in the main Optima laser diode page.

Please click on the following link for more information:

<http://www.optima-optics.com/ld.htm>

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Mitsubishi Laser Diode ML1012R Specifications



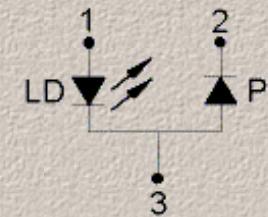
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685nm / 35mW / 5.6mm package

Absolute Maximum Ratings (Tc=25°C)

Characteristic	Symbol	Value	Unit
Optical output power	Po	35	mW
Pulse optical power output	Po (pulse)	50*	
Laser diode reverse voltage	VR(LD)	2	V
Photodiode reverse voltage	VR(PD)	30	V
Photodiode forward current	IF(PD)	10	mA
Operating temperature	Topr	-10 to +60	°C
Storage temperature	Tstg	-10 to +100	°C

Notes: * Pulse condition: Less than 50% duty cycle, less than 1µs pulse width.



ML1012R, 5.6mm Package
Internal Circuit & Pin Connections

Optical and Electrical Characteristics (Tc=25°C)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	Ith	-	35	60	mA	-
Operating current	Iop	-	80	120	mA	Po=30mW
Slope efficiency	η	-	0.75	-	mW/mA	Po=30mW
Laser diode operating voltage	Vop	2.0	2.4	3.0	V	Po=30mW
Lasing wavelength	λp	670	685	700	nm	Po=30mW
Beam divergence (parallel)	θ //	7	9.5	12	deg	Po=30mW (FWHM)

Beam divergence (perpendicular)	$\theta \perp$	16	20	25	deg	$P_o=30\text{mW}$ (FWHM)
Monitor current	I_m	0.05	0.2	1.5	mA	$P_o=30\text{mW}$, $V_{R(PD)}=1\text{V}$, $R_L=10\text{ ohm}$ (PD resistance load)
Photodiode dark current	$I_{D(PD)}$	-	-	0.5	$\mu\text{ A}$	$V_{R(PD)}=10\text{V}$
Photodiode capacitance	$C_{T(PD)}$	-	7	-	pF	$f=1\text{MHz}$, $V_{R(PD)}=5\text{V}$

Disclaimer: The laser diode information summarized above is based on the respective diode manufacturer's commercial catalog and/or data sheet specifications. The data is presumed to be accurate; however, it is subject to change without notice. Optima makes no representation as to the accuracy of the information and does not assume any responsibility for errors or omissions contained herein. The user must refer to the manufacturers specifications for details concerning the intended application and operation, diode limitations, and safety.

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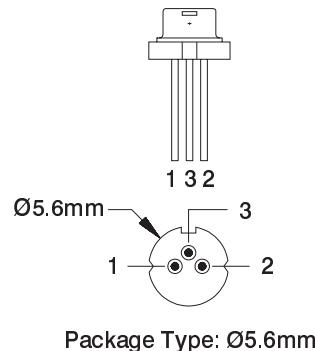
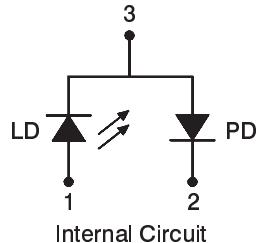
is is i L 2 Laser Diode pe ifi a io s

The Mitsubishi L 0 is a high power Al_{0.5}P laser diode which provides a stable, single transverse mode oscillation with a typical emission wavelength of 655nm and the continuous light output of 30mW. The diode is suitable for large capacity optical disc memories and similar optical systems. With a visible wavelength operating between 600nm and 700nm, the 30mW output is highly visible. The L 0 has a 5.6mm diameter package.

Absolute Maximum Ratings (Tc = 5°C)

Characteristic	Symbol	Value	Unit
Optical output power	P _o	35	mW
Pulse optical output power	P _o (pulse)	50 *	mW
Laser diode reverse voltage	V _R (LD)	2	V
Photodiode reverse voltage	V _R (PD)	30	V
Photodiode forward current	I _F (PD)	10	mA
Operating temperature	T _{opr}	-10 to +60	°C
Storage temperature	T _{stg}	-10 to +100	°C

Notes: * Pulse condition - Less than 50% duty cycle, less than 1 μs pulse width



Operating and Electrical Characteristics (Tc = 5°C)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	I _{th}	—	35	60	mA	—
Operating current	I _{op}	—	80	120	mA	P _o =30mW
Slope efficiency	η	—	0.75	—	mW/mA	P _o =30mW
Operating voltage	V _{op}	2.0	2.4	3.0	V	P _o =30mW
Lasing Wavelength	λ _p	670	685	700	nm	P _o =30mW
Beam divergence (parallel)	θ	7	9.5	12	deg	P _o =30mW, (FWHM)
Beam divergence (perpendicular)	θ _⊥	16	20	25	deg	P _o =30mW, (FWHM)
Monitor current	I _m	0.05	0.2	1.5	mA	P _o =30mW, VR(PD)=1V RL=10V (PD resistance load)
Photodiode dark current	I _D (PD)	—	—	0.5	μA	VR(PD)=10V
Photodiode capacitance	C _T (PD)	—	7	—	pF	f=1MHz, VR(PD)=5V

Disclaimer: The laser diode information summarized above is based on the respective diode manufacturer's commercial catalog and/or data sheet specifications. The data is presumed to be accurate; however, it is subject to change without notice. Optima makes no representation as to the accuracy of the information and does not assume any responsibility for errors or omissions contained herein. The user must refer to the manufacturers specifications for details concerning the intended application and operation, diode limitations, and safety.

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Mitsubishi Laser Diode ML1013R Specifications



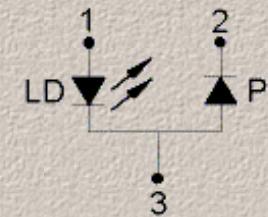
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685nm / 50mW / 5.6mm package

Absolute Maximum Ratings (Tc=25°C)

Characteristic	Symbol	Value	Unit
Optical output power	Po	50	mW
Pulse optical power output	Po (pulse)	60*	
Laser diode reverse voltage	VR(LD)	2	V
Photodiode reverse voltage	VR(PD)	30	V
Photodiode forward current	IF(PD)	10	mA
Operating temperature	Topr	-10 to +60	°C
Storage temperature	Tstg	-10 to +100	°C

Notes: * Pulse condition: Less than 50% duty cycle, less than 1μs pulse width.



ML1013R, 5.6mm Package
Internal Circuit & Pin Connections

Optical and Electrical Characteristics (Tc=25°C)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	Ith	-	35	60	mA	-
Operating current	Iop	-	100	140	mA	Po=50mW
Slope efficiency	η	-	0.75	-	mW/mA	Po=50mW
Laser diode operating voltage	Vop	2.0	2.7	3.0	V	Po=50mW
Lasing wavelength	λp	670	685	700	nm	Po=50mW
Beam divergence (FWHM)	θ //	7	9.5	12	deg	Po=50mW

Beam divergence (FWHM)	$\theta \perp$	16	20	25	deg	Po=50mW
Monitor current	Is	0.05	0.3	2.5	mA	Po=50mW, VR(PD)=1V, RL=10 ohm (PD resistance load)
Photodiode dark current	ID(PD)	-	-	0.5	μ A	VR(PD)=10V
Photodiode capacitance	CT(PD)	-	7	-	pF	f=1MHz, VR(PD)=5V

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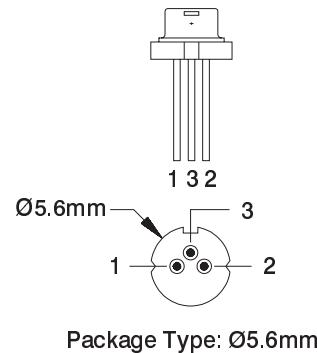
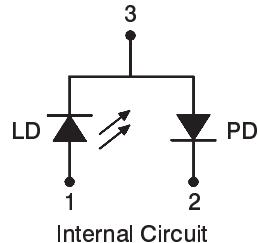
is is i L Laser Diode pe ifi a io s

The Mitsubishi L03 is a high power Al_{0.5}nP laser diode which provides a stable, single transverse mode oscillation with a typical emission wavelength of 655nm and the continuous light output of 50mW. The diode is suitable for large capacity optical disc memories and similar optical systems. With a visible wavelength operating between 600nm and 700nm, the 50mW output is highly visible. The L03 has a 5.6mm diameter package.

Absolute Maximum Ratings (Tc = 5°C)

Characteristic	Symbol	Value	Unit
Optical output power	P _o	50	mW
Pulse optical output power	P _o (pulse)	60 *	mW
Laser diode reverse voltage	V _R (LD)	2	V
Photodiode reverse voltage	V _R (PD)	30	V
Photodiode forward current	I _F (PD)	10	mA
Operating temperature	T _{opr}	-10 to +60	°C
Storage temperature	T _{stg}	-10 to +100	°C

Notes: * Pulse condition - Less than 50% duty cycle, less than 1 μs pulse width



Operating and Electrical Characteristics (Tc = 5°C)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	I _{th}	—	35	60	mA	—
Operating current	I _{op}	—	100	140	mA	P _o =50mW
Slope efficiency	η	—	0.75	—	mW/mA	P _o =50mW
Operating voltage	V _{op}	2.0	2.7	3.0	V	P _o =50mW
Lasing Wavelength	λ _p	670	685	700	nm	P _o =50mW
Beam divergence (parallel)	θ	7	9.5	12	deg	P _o =50mW, (FWHM)
Beam divergence (perpendicular)	θ _⊥	16	20	25	deg	P _o =50mW, (FWHM)
Monitor current	I _m	0.05	0.3	2.5	mA	P _o =50mW, VR(PD)=1V RL=10V (PD resistance load)
Photodiode dark current	I _D (PD)	—	—	0.5	μA	VR(PD)=10V
Photodiode capacitance	C _T (PD)	—	7	—	pF	f=1MHz, VR(PD)=5V

Disclaimer: The laser diode information summarized above is based on the respective diode manufacturer's commercial catalog and/or data sheet specifications. The data is presumed to be accurate; however, it is subject to change without notice. Optima makes no representation as to the accuracy of the information and does not assume any responsibility for errors or omissions contained herein. The user must refer to the manufacturers specifications for details concerning the intended application and operation, diode limitations, and safety.

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Laser Diode Specifications

Optima is no longer recommending, selling, or supporting Hitachi laser diodes.

All Hitachi laser diode specifications have been removed from the Optima website.

Possible substitute part: None

Detailed specifications and pricing for laser diodes from other manufacturers are listed in the main Optima laser diode page. Please click on the following link for more information:

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OPTIMA®

Laser Diode Optics



Cost Effective Optima Lenses for Collimating and Focusing Laser Diodes

Collimating and focusing a laser diode is perhaps the most critical prerequisite in any laser diode application. While the characteristics of a laser diode might be ideal for your application, the laser diode must be matched with the appropriate optics to create a useable beam. Typically, the laser diode is collimated with one lens and a second lens is used to focus the beam. However, many applications exist where a single lens is used to either focus or collimate the beam. In either case, most laser diodes require a collimating lens with a large numerical aperture (NA) to efficiently capture the widely divergent perpendicular axis.

Optima manufacturers the following laser diode lenses and laser diode optics:

[Multiple Element Collimating and Focusing Lenses](#)

[Molded Glass Aspheric Lenses](#)

[Injection Molded Plastic Aspheric Lenses](#)

[Achromats, Doublets, Plano-convex, Plano-concave, etc....](#)



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Multi-Element Laser Diode Collimating and Focusing Lenses



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For the most demanding application, a three or four element spherical lens achieves a level of optical performance difficult to obtain with any single element lens. To assure diffraction-limited performance, start by collimating the diode with one of the Optima 336 Series multi-element lenses. All 336 Series lenses are computer optimized to minimize aberrations, maximize coupling efficiency, and function over a broad range of wavelengths and normal manufacturing tolerances. The lenses can be used with most visible and near-infrared laser diodes and are currently used in a wide array of products including the following:

- **Bar-code Readers**
- **Alignment and Distance Measuring Systems**
- **Positioning and Edge Finding Equipment**
- **Light Scatter and Particle Counters**
- **Diode Based Interferometers**
- **Fiber Optic Communications**

The following paragraphs briefly describe the attributes and differences between the three 336 Series collimating lenses.

The 336-1027 is an excellent general purpose collimating lens, its small physical size is compatible with both 5.6mm and 9.0mm diameter laser diodes, making a very compact assembly. A relatively large numerical aperture (NA) of 0.48 captures a large percentage of the beam from most common laser diodes -- coupling efficiencies typically range from 91% to 95%. The 336-1027 is available with three standard MgF2 anti-reflection coatings designated as: -660 for visible laser diodes (633nm to 750nm); -785 for use with most near-infrared diodes (750nm to 980nm); and the -140 AR coating for use with 1300nm and 1550nm laser diodes.

The 336-0965-780 is a very high quality collimating lens suitable for more demanding applications. With a longer focal length and larger clear aperture, this lens provides a slightly larger collimated beam and consequently lower beam divergence. A moderate numerical aperture of 0.389 provides coupling efficiencies ranging from 83% to 85%.

The 336-0808-830 has a longer focal length and larger clear aperture than either of the lenses described above creating the largest collimated beam diameter. The 336-0808-830 is recommended for precision alignment systems, laser range finding, and other applications that require a laser diode beam to be projected over long distances.

Multiple Element Focusing Lens: The 336-0000-780 lens is a three element spherical lens used to refocus the collimated beam from a laser diode. For optimum performance, the focusing lens should be used with a collimating lens having the same size clear aperture, i.e. the 336-1027 collimating lens. In this case, the large numerical aperture and short focal length of the focusing lens will provide superior coupling efficiency and diffraction-limited spot.

Multiple Element Spherical Lens Specifications:

Part Number	336-0000-780	336-1027-660	336-1027-785	336-0808-830	336-0965-780
Unit price (Qty 1-49)	\$26.50		\$27.90	\$84.00	\$73.50
Description	Objective Lens	Collimating Lens			
Conjugate Distance	Infinite	Infinite			
Design Wavelength	780 nm	660 nm	785 nm	830 nm	780 nm
Focal Length	4.516 mm	4.476 mm	4.516 mm	8.001 mm	7.003 mm
Working/Source Distance	2.0 mm	2.17 mm	2.20 mm	2.25 mm	2.0 mm
Numerical Aperture	.476	.476	.476	.368	.389
Clear Aperture	4.30 mm	4.30 mm	4.30 mm	5.90 mm	5.45 mm
F#	1.05	1.04	1.05	1.355	1.28
Field Size (diameter)	0.156 mm	0.156 mm	0.158 mm	0.201 mm	0.176 mm
AR Coating, MgF2	780 nm	660 nm	785 nm	830 nm	780 nm
Transmission	> 96%		> 93%		> 95%
Cover Glass Thickness	1.2 mm		0.25 ~ 0.30 mm		
Cover Glass Index (n)	1.55	1.52023	1.51107	1.500	1.525
Cell Material & Finish	Aluminum / Black Anodized			Brass	
Cell Dimensions (diameter x length)	Ø6.4 x 4.85 mm	Ø6.4 x 6.3 mm		Ø8.0 x 11.0 mm	Ø10.0 x 10.0 mm

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Optima Laser Diode pins

Most Effective Lenses for Collimating and Focusing Laser Diodes

Collimating and focusing a laser diode is perhaps the most critical prerequisite in any laser diode application. While the characteristics of a laser diode might be ideal for your application, the laser diode must be matched with the appropriate optics to create a useable beam. Typically, the laser diode is collimated with one lens and a second lens is used to focus the beam. However, many applications exist where a single lens is used to either focus or collimate the beam. In either case, most laser diodes require a collimating lens with a large numerical aperture (NA) to efficiently capture the widely divergent perpendicular axis.



336-0000-780 336-0808-660 306-0065-780 300-0360-780

336-1027-660 336-0965-780 305-0065-780 300-0355-780

Multi-Element Lenses for Optimal Performance

For the most demanding applications, a three or four element spherical lens achieves a level of optical performance difficult to obtain with any single element lens. To assure diffraction-limited performance, start by collimating the diode with one of the Optima 336 series multi-element lenses. All 336 series lenses are computer optimized to minimize aberrations, maximize coupling efficiency, and function over a broad range of wavelengths and normal manufacturing tolerances. The lenses can be used with most visible and near-infrared laser diodes and are currently used in a wide array of products including the following:

- Alignment and Distance Measurement Systems
- Positioning and Navigation Equipment
- Light Scatter and Particle Counters
- Linear and rotary encoders
- Free-space Laser Communication Systems
- Bar-code readers

The following paragraphs briefly describe the attributes and differences between the three 336 series collimating lenses.

336-10 -660, -85, and -140 — These are excellent general purpose collimating lenses; its small physical size is compatible with both 5.6mm and 9.0mm diameter laser diodes, making a very compact assembly. A relatively large numerical aperture (NA) of 0.7 captures a large percentage of the beam from most common laser diodes — coupling efficiencies typically range from 90% to 95%. The 336-10 is available with three standard glass anti-reflection coatings designated as: -660 for visible laser diodes (633nm to 50nm); -85 for use with most near-infrared diodes (50nm to 900nm); and the -140A coating for use with 300nm to 550nm laser diodes.

336-0 65- 80 — This is a very high quality collimating lens suitable for more demanding applications where wavefront aberration is critical. With a longer focal length and larger clear aperture, this lens provides a slightly larger collimated beam and consequently lower beam divergence. A moderate numerical aperture of 0.39 provides coupling efficiencies ranging from 30% to 50%.

336-0808-830 — With a longer focal length and larger clear aperture than either of the lenses described above, this lens creates the largest collimated beam diameter. The 336-0 0 - 830 is recommended for precision alignment systems, laser range finding, and other applications that require a laser diode beam to be projected over long distances with low divergence.

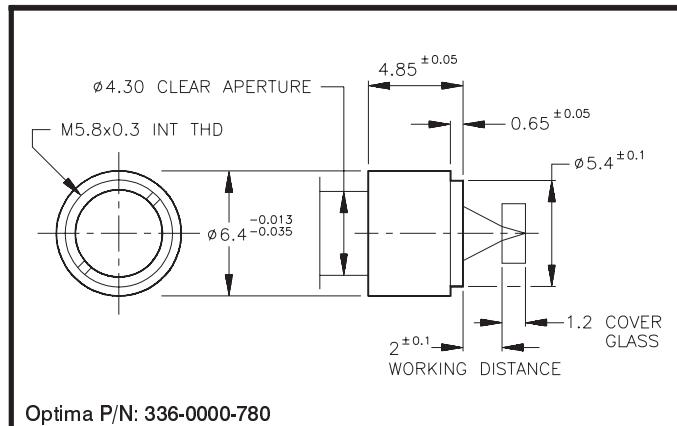
Multiple Element Focusing Lens — The 336-0000-00 lens is a three element spherical lens used to refocus the collimated beam from a laser diode. For optimum performance, the focusing lens should be used with a collimating lens having the same size clear aperture, i.e. the 336-10 collimating lens. In this case, the large numerical aperture and short focal length of the focusing lens will provide superior coupling efficiency and diffraction-limited spot.

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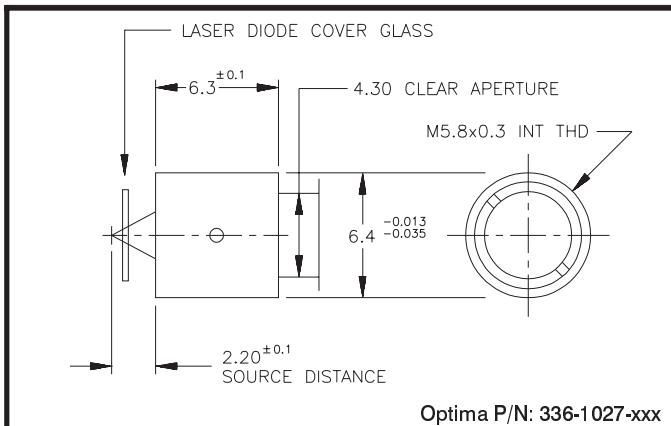
Optima Multiple Element Spherical Lens Specifications:

PART NUMBER	336-0000-780	336-1027-660	336-1027-785	336-0808-830	336-0965-780
UNIT PRICE (Qty 1-49 pcs.)	\$26.50	\$27.90		\$84.00	\$73.50
DESCRIPTION	Objective lens	Collimating lens			
CONJUGATE DISTANCE	Infinite	Infinite			
DESIGN WAVELENGTH (note 1)	780nm	660nm	785nm	830nm	780nm
FOCAL LENGTH	4.516mm	4.476mm	4.516mm	8.01mm	7.003mm
WORKING / SOURCE DISTANCE	2.0mm	2.17mm	2.20mm	2.25mm	2.0mm
NUMERICAL APERTURE	0.476	0.476	0.476	0.368	0.389
CLEAR APERTURE	4.30mm	4.30mm	4.30mm	5.89mm	5.45mm
F#	1.05	1.04	1.05	1.36	1.28
FIELD SIZE DIAMETER	0.156mm	0.156mm	0.158mm	0.201mm	0.176mm
AR COATING DESIGN CENTER, MgF2	780nm	660nm	785nm	830nm	780nm
TRANSMISSION	>96%	>93%		>95%	>95%
COVER GLASS THICKNESS	1.2mm	0.25mm ~ 0.30mm			
COVER GLASS INDEX (n)	1.55	1.52023	1.51107	1.51097	45
CELL MATERIAL & FINISH	Aluminum / Black Anodized			Brass	
CELL DIMENSIONS (diameter x length)	Ø6.4mm x 4.85mm	Ø6.4mm x 6.3mm	Ø8mm x 11mm	Ø10mm x 10mm	

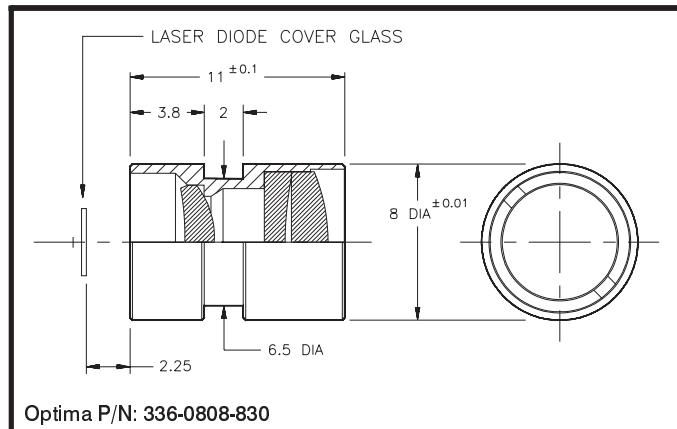
Notes: 1) In the specifications listed above, the design wavelength is used to calculate the focal length; however, this does not limit use of the lens to this particular wavelength — these lenses can be used with both near-infrared and visible laser diodes from 635nm through 850nm.



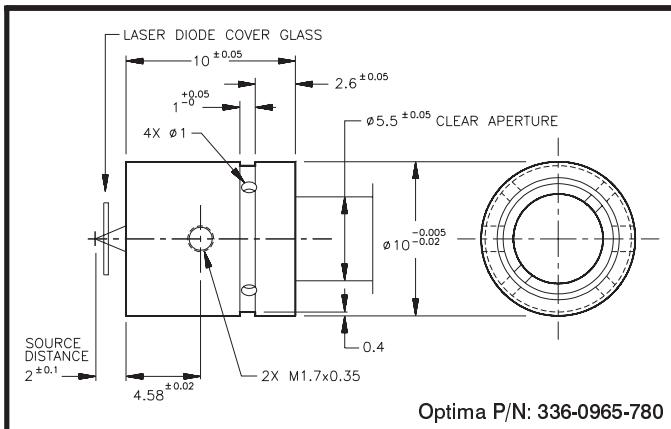
Optima P/N: 336-0000-780



Optima P/N: 336-1027-xxx



Optima P/N: 336-0808-830



Optima P/N: 336-0965-780

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Molded Glass Aspheric Lenses



[MOLDED.PDF](#) (66K) Click on the file name to download an Adobe PDF file covering this section.

Collimating and Focusing Lenses for Laser Diodes

Diffraction-limited and very cost effective, a precision-molded glass aspheric lens is an attractive compromise between a multi-element lens and a molded plastic lens. The molded glass asphere has two basic advantages over a multi-element lens; first, the aspheric design reduces spherical aberration and coma in a single element; and second, overall light transmission is generally greater with fewer optical surfaces.

As compared with plastic lenses; molded glass aspheric lenses will operate over a much broader temperature and humidity range without performance degrading. Because of these advantages, molded glass lenses are often used in products such as laser printers, optical disc storage devices, and optical communications systems.



New Lens — A larger numerical aperture is often very desirable when coupling a collimating lens with a laser diode. Our newest molded glass asphere P/N 305-0464-780, has an NA of 0.5 and a focal length of 4mm which seems ideally suited for many laser diode applications. With a 0.5 NA a coupling efficiency over 90% can be achieved with most diodes. Detailed [specifications](#) are listed below:

The popular 305-0065-780 aspheric lens is available in three configurations: an unmounted single element, part number 305-0065-780, and two convenient mounted lenses which help reduce some of the tedious problems associated with handling a very small lens. The 306-0065-780 mount has an extra-fine pitch thread (.375-64) on the outside diameter that facilitates precise control in adjusting the focus or collimation of a laser diode. The 310-0065-780 mount is a plain 8mm diameter aluminum cell that can be easily incorporated into the user's laser diode assembly.

The 305-8040-780 is now available with a threaded mount, P/N 307-8040-780.

Threaded Mount, with 3/8-64 fine pitch thread, part numbers and prices:

Basic optical specifications are the same as the lenses listed in the "unmounted" table below.

Part Number	Unit price (Qty 1-49)	Dimensions (thread diameter x overall length)
306-0065-780	\$20.90	3/8-64 x 3.2 mm
307-0464-780	\$21.85	
307-8040-780	\$30.55	3/8-64 x 4.95 mm

307-4606-670

\$21.50

Mounted lens, cell without threads, part numbers and prices:

Part Number	Unit price (Qty 1-49)	Dimensions (diameter x overall length)
310-0065-780	\$20.50	8mm x 4.95 mm

Unmounted, Molded Glass Aspheric Lens Specifications:

Part Number (unmounted lens)	305-0464-780	305-0065-780	305-8040-780	305-4606-670
Unit price (Qty 1-49)	\$14.60	\$16.40	\$21.85	\$17.00
Description	Molded Glass Aspheric Lens, Unmounted			
Conjugate Distance	Infinite			
Design Wavelength	780 nm	780 nm	780 nm	655 nm
Focal Length	4 mm	6.25 mm	8.00 mm	4.60 mm
Working/Source Distance	3.942 mm	4.57 mm	8.33 mm	2.90 mm
Numerical Aperture	0.50	0.40	0.25	0.53
Clear Aperture	4.00 mm	5.00 mm	4.06 mm	4.89 mm
F#	1.00	1.25	1.97	0.94
Field Size (diameter)	0.050	0.100 mm	0.200 mm	0.100 mm
AR Coating, MgF2		780 nm		670 nm
Transmission	> 97%	> 98%	> 96%	> 95%
Cover Glass Thickness		0.25 ~ 0.30 mm		.275 mm
Cover Glass Index (n)	1.500	1.511	1.511	1.510
Temperature Range (°C)		-20 ~ +85		
Dimensions (diameter x length)	Ø6.40 x 2.5 mm	Ø6.38 x 2.5 mm	Ø6.40 x 2.5 mm	Ø6.0 x 3.10 mm

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Last modified: December 30, 2000

Optima® Molded Lass spheric Lenses

Diffraction-limited and very cost effective, a precision-molded glass aspheric lens is an attractive compromise between a multi-element lens and a molded plastic lens. The molded glass asphere has two basic advantages over a multi-element lens; first, the aspheric design reduces spherical aberration and coma in a single element; and second, overall light transmission is generally greater with fewer optical surfaces.

As compared with plastic lenses; molded glass aspheric lenses will operate over a much broader temperature and humidity range without performance degrading. Because of these advantages, molded glass lenses are often used in products such as laser printers, optical disc storage devices, and optical communications systems.

New Lens P/N305-0464- 80 — A larger numerical aperture is often very desirable when coupling a collimating lens with a laser diode. Our newest molded glass asphere P/N 305-0 6 - 0, has an NA of 0.5 and a focal length of mm which is ideally suited for many laser diode applications. With a 0.5 NA, a coupling efficiency over 90% can be achieved with most diodes. Detailed specifications are listed below:

Optima Molded Lass spheric Lens Specifications:

PART NUMBER	305-0065-780	305-0464-780	305-4606-670	305-8040-780
UNIT PRICE (Qty 1-49 pcs.)	\$16.40	\$14.60	\$17.00	\$21.85
DESCRIPTION	Collimating lens, Molded Glass Asphere, Unmounted			
CONJUGATE DISTANCE	Infinite			
DESIGN WAVELENGTH (note 1)	780nm	780nm	655nm	780nm
FOCAL LENGTH	6.25mm	4.00mm	4.60mm	8.00mm
WORKING / SOURCE DISTANCE	4.57mm	3.942mm	2.90mm	8.33mm
NUMERICAL APERTURE	0.40	0.50	0.53	0.25
CLEAR APERTURE	5.00mm	4.00mm	4.89mm	4.06mm
F#	1.25	1.00	0.94	1.97
FIELD SIZE DIAMETER	0.100mm	0.050mm	0.100mm	0.200mm
AR COATING DESIGN CENTER, MgF2	780nm		670nm	780nm
TRANSMISSION	>98%	>97%	>95%	>96%
COVER GLASS THICKNESS	0.25mm ~ 0.30mm		.275mm	0.25mm ~ 0.30mm
COVER GLASS INDEX (n)	1.511	1.50	1.510	1.500
TEMPERATURE RANGE	-20°C to +85°C			
LENS DIMENSIONS (diameter x length)	Ø6.38mm x 2.5mm	Ø6.40mm x 2.5mm	Ø6.00mm x 3.10mm	Ø6.40 x 2.5mm

Notes: 1) In the specifications listed above, the design wavelength is used to calculate the focal length; however, this does not limit use of the lens to this particular wavelength — these lenses can be used with both near-infrared and visible laser diodes from 635nm through 850nm.

Mounted aspheric lens with fine pitch threads — The popular 305-0065- 0 aspheric lens is available in three configurations: an unmounted single element, part number 305-0065- 0, and two convenient mounted lenses which help reduce some of the tedious problems associated with handling a very small lens. The 305-0065- 0 mount is a plain mm diameter aluminum cell that can be easily incorporated into the user's laser diode assembly. Lenses p/n 305-0 6 - 0, 305- 606-6 0, and p/n 305- 0 0- 0 are also available in a threaded mount, the p/n prefix changes to 306- - or 30- - as listed in the table below. All of the threaded mounts have an extra-fine pitch thread (.35-6) on the outside diameter that facilitates precise control in adjusting the focus or collimation of a laser diode.

MOUNTED ASPHERIC LENS P/N	307-0464-780	306-0065-780	310-0065-780	307-4606-670	307-8040-780
UNIT PRICE (Qty 1-49 pcs.)	\$21.85	\$20.90	\$20.50	\$21.50	\$30.55
DESCRIPTION	Threaded Mount		Plain Cell	Threaded Mount	
CELL DIMENSIONS (diameter x length)	3/8-64 Thd. x 3.2mm		Ø8mm x 4.95mm	3/8-64 Thread x 4.95mm	

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Injection Molded Plastic Aspheric Lenses



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Collimating and Focusing Lenses for Laser Diodes

While glass lenses are preferred, there are several product applications where a high quality plastic lens can be effectively utilized. The 300 Series plastic aspheric collimating and objective lenses offer a lower cost alternative to glass and still perform well over a temperature range actually exceeding the upper limit for most laser diodes. Plastic lenses are used in products such as laser pointers, construction levels, and less critical alignment and position sensing devices.

If you need a collimated beam with smaller dimensions, consider using the 300-0380-780 lens or, the LDM 4500 KIT. For example... when used with the Hitachi HL6312G (635nm/5mW) laser diode, a collimated beam measures approximately 0.715 mm in the parallel axis by 2.85 mm in the perpendicular axis, with divergence angles of 1.2 mrad x 0.34 mrad respectively. (The figures mentioned may vary from one diode to another or, with other manufacturers diodes).

The plastic lenses are available unmounted or in a convenient aluminum mount with a .375-64 external thread. The extra-fine pitch thread allows precise adjustment of the lens when collimating or focusing the beam.

Injection Molded Aspheric Lens Specifications:

Part Number (thread mount)	302-0355-780	302-0360-780	302-0380-780	302-0395-780
Unit price (Qty 1-49)	\$13.25	\$11.15	\$13.55	\$12.60
Description	Injection Molded Plastic Aspheric Lens, with 3/8-64 Threaded Mount			
Optical Specifications	Basic optical specifications as listed in the following section			
Dimensions (diameter x length)	3/8-64 external thread. x 5.3 mm	3/8-64 external thread. x 5.9 mm	3/8-64 external thread. x 3.8 mm	

Part Number (unmounted lens)	300-0355-780	300-0360-780	300-0380-780	300-0395-780
Unit price (Qty 1-49)	\$7.05	\$5.15	\$4.50	\$4.80
Description	Injection Molded Plastic Aspheric Lens, unmounted			
Conjugate Distance	Infinite			
Design Wavelength	780 nm			

Focal Length	4.50 mm	4.50 mm	3.40 mm	16 mm
Working/Source Distance	1.90 mm	1.90 mm	1.43 mm	13.79 mm
Numerical Aperture	.50	.45	.471	.144
Clear Aperture	4.50 mm	4.05 mm	3.20 mm	4.60 mm
F#	1.00	1.11	1.06	3.48
Field Size (diameter)	0.110 mm	0.100 mm	0.150 mm	0.559 mm
AR Coating, MgF2	780 nm			
Transmission	> 97%	> 97%	> 95%	> 97%
Cover Glass Thickness	1.25 mm			
Cover Glass Index (n)	1.510	1.55	1.55	1.51
Temperature Range	Storage Temperature -30 ~ +75 °C Working Temperature -10 ~ +65 °C			
Dimensions (diameter x length)	Ø7.4 x 3.4 mm	Ø7.4 x 3.55 mm	Ø5.0 x 2.11 mm	Ø6.5 x 2.33 mm

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Optima® In ection Molded Plastic spheric Lenses

While glass lenses are generally preferred, there are several product applications where a high quality plastic lens can be effectively utilized. The 300 series plastic aspheric collimating and objective lenses offer a lower cost alternative to glass and still perform well over a temperature range actually exceeding the upper limit for most laser diodes. Plastic lenses are used in products such as laser pointers, construction levels, and less critical alignment and position sensing devices.

New Lens, P/N300-0380- 80 creates a Smaller collimated beam — If you need a collimated beam with smaller dimensions, consider using the 300-0380-0 plastic lens and/or the Optima LD 500 T Laser Diodeounting it which includes the new smaller plastic asphere. As an example... when this lens is used with the Hitachi HL63 (635nm/5m²) laser diode, a collimated beam measures approximately 0.5 mm in the parallel axis by .5 mm in the perpendicular axis, with divergence angles of .1 mrad and 0.3 mrad respectively. (The figures mentioned may vary from one diode to another or, with other manufacturers diodes).

P/N300-0355-80 creates a Larger, More circular collimated beam — If you need a collimated beam with low divergence and consequently a smaller beam at long distances, consider the Optima 300-0395-0. With a long focal length (6mm) and small numerical aperture (NA .1) this lens creates a relatively large diameter beam that's more circular than the output from the typical laser diode collimating lens. Also, the 300-0395-0 lens is a very high-quality injection molded plastic lens this lens has been used in digital laser communication systems which are extremely sensitive to lens aberrations and diffraction patterns that can be misread as data when a beam sweeps across a detector. The only negative aspect of the lens might be the small NA the coupling efficiency (or total transmission) for most visible laser diodes is just under 50%. Please refer to the lens specifications below for detailed information.

For reference we've profiled the beam from a 300-0395-0 lens using a Hitachi HL63 laser diode; at 100 mm from the lens, a collimated beam measures 3.3 mm (.65 mm (measured at the 1/e² clip point, with 3.3 mm being the laser diode's parallel axis).

Optima In ection Molded Plastic spheric Lens Specifications:

PART NUMBER	300-0355-780	300-0360-780	300-0380-780	300-0395-780
UNIT PRICE (Qty 1-49 pcs.)	\$7.05	\$5.15	\$4.50	\$4.80
DESCRIPTION	Collimating lens, Injection Molded Plastic Asphere, Unmounted			
CONJUGATE DISTANCE	Infinite			
DESIGN WAVELENGTH (note 1)	780nm			
FOCAL LENGTH	4.50mm	4.50mm	3.40mm	16mm
WORKING / SOURCE DISTANCE	1.90mm	1.90mm	1.43mm	13.79mm
NUMERICAL APERTURE	0.50	0.45	0.471	0.144
CLEAR APERTURE	4.50mm	4.05mm	3.20mm	4.80mm
F#	1.00	1.11	1.06	1.67
FIELD SIZE DIAMETER	0.100mm	0.050mm	0.150mm	0.100mm
AR COATING DESIGN CENTER, MgF ₂	780nm			
TRANSMISSION	>98%	>97%	>95%	>97%
COVER GLASS THICKNESS	1.25mm			
COVER GLASS INDEX (n)	1.510	1.55	1.55	1.51
TEMPERATURE RANGE	Storage Temp. -30°C to +75°C, Working Temp. -10°C to +65°C			
LENS DIMENSIONS (diameter x length)	Ø7.4mm x 3.4mm	Ø7.4mm x 3.55mm	Ø5.0mm x 2.11mm	Ø6.5 x 2.33mm

Notes: 1) In the specifications listed above, the design wavelength is used to calculate the focal length; however, this does not limit use of the lens to this particular wavelength — these lenses can be used with both near-infrared and visible laser diodes from 635nm through 850nm.

MOUNTED PLASTIC LENS P/N	302-0355-780	302-0360-780	302-0380-780	302-0395-780
UNIT PRICE (Qty 1-49 pcs.)	\$13.25	\$11.15	\$13.55	\$12.60
CELL DIMENSIONS (diameter x length)	3/8-64 Thd. x 5.33mm		3/8-64 Thd. x 5.9mm	3/8-64 Thd. x 3.8mm

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Achromats, Doublets, Plano-convex Plano-concave, Bi-convex, Bi-concave, etc.

In addition to laser diode optics, Optima also manufactures singlet lenses, doublet lenses, and optical flats i.e. mirrors, beamsplitters, windows, and prisms. Generally, these components are produced at OEM quantity levels and are not offered in small quantities. However, over the years we have manufactured a few standard achromats with small diameters and relatively short focal lengths. These high-quality lenses are ideally suited for use in laser diode based applications:

Standard Achromat Specifications:

Part Number	414-1575-670	414-2085-670	414-3090-785
Unit Price (Qty 1-24)	\$23.75	\$22.70	\$26.75
Description	Spherical Achromat		
Focal Length	15 mm	19.7 mm	30 mm
Design Wavelength	780 nm	785 nm	785 nm
Diameter	7.5 mm	8.5 mm	9.0 mm
Clear Aperture	6.5 mm	7.5 mm	8 mm
Center Thickness	3.68 mm	3.9 mm	5.8 mm
AR Coating, MgF2	670 nm	670 nm	785 nm

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Optima Laser Diode Pins

Most Effective Lenses for Collimating and Focusing Laser Diodes

Collimating and focusing a laser diode is perhaps the most critical prerequisite in any laser diode application. While the characteristics of a laser diode might be ideal for your application, the laser diode must be matched with the appropriate optics to create a useable beam. Typically, the laser diode is collimated with one lens and a second lens is used to focus the beam. However, many applications exist where a single lens is used to either focus or collimate the beam. In either case, most laser diodes require a collimating lens with a large numerical aperture (NA) to efficiently capture the widely divergent perpendicular axis.



Multi-Element Lenses for Optimal Performance

For the most demanding applications, a three or four element spherical lens achieves a level of optical performance difficult to obtain with any single element lens. To assure diffraction-limited performance, start by collimating the diode with one of the Optima 336 series multi-element lenses. All 336 series lenses are computer optimized to minimize aberrations, maximize coupling efficiency, and function over a broad range of wavelengths and normal manufacturing tolerances. The lenses can be used with most visible and near-infrared laser diodes and are currently used in a wide array of products including the following:

- Alignment and Distance Measurement Systems
- Positioning and Navigation Equipment
- Light Scatter and Particle Counters
- Linear and rotary encoders
- Free-space Laser Communication Systems
- Barcode Readers

The following paragraphs briefly describe the attributes and differences between the three 336 series collimating lenses.

336-10 -660, -85, and -140 — These are excellent general purpose collimating lenses; its small physical size is compatible with both 5.6mm and 9.0mm diameter laser diodes, making a very compact assembly. A relatively large numerical aperture (NA) of 0.7 captures a large percentage of the beam from most common laser diodes — coupling efficiencies typically range from 90% to 95%. The 336-10 is available with three standard glass anti-reflection coatings designated as: -660 for visible laser diodes (633nm to 50nm); -85 for use with most near-infrared diodes (50nm to 900nm); and the -10 A coating for use with 300nm to 550nm laser diodes.

336-0 65- 80 — This is a very high quality collimating lens suitable for more demanding applications where waveform aberration is critical. With a longer focal length and larger clear aperture, this lens provides a slightly larger collimated beam and consequently lower beam divergence. A moderate numerical aperture of 0.39 provides coupling efficiencies ranging from 30% to 50%.

336-0808-830 — With a longer focal length and larger clear aperture than either of the lenses described above, this lens creates the largest collimated beam diameter. The 336-0 0 - 830 is recommended for precision alignment systems, laser range finding, and other applications that require a laser diode beam to be projected over long distances with low divergence.

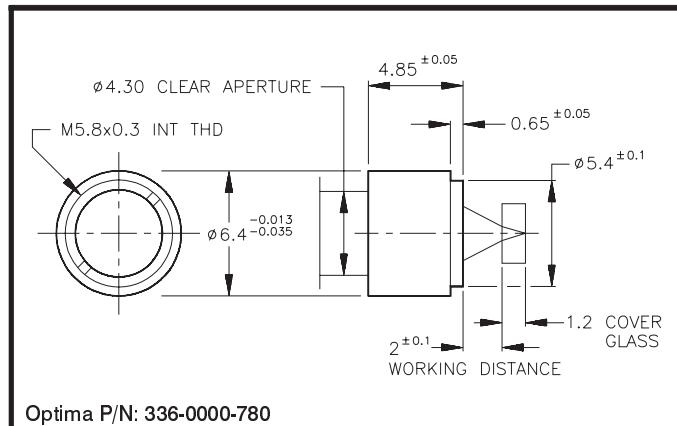
Multiple Element Focusing Lens — The 336-0000-000 lens is a three element spherical lens used to refocus the collimated beam from a laser diode. For optimum performance, the focusing lens should be used with a collimating lens having the same size clear aperture, i.e. the 336-10 collimating lens. In this case, the large numerical aperture and short focal length of the focusing lens will provide superior coupling efficiency and diffraction-limited spot.

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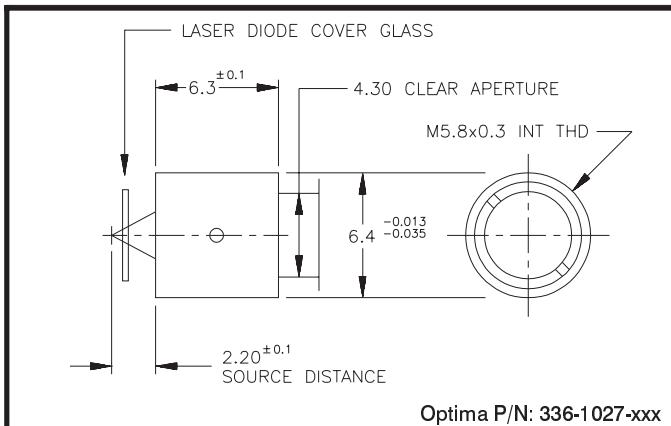
Optima Multiple Element Spherical Lens Specifications:

PART NUMBER	336-0000-780	336-1027-660	336-1027-785	336-0808-830	336-0965-780
UNIT PRICE (Qty 1-49 pcs.)	\$26.50	\$27.90		\$84.00	\$73.50
DESCRIPTION	Objective lens	Collimating lens			
CONJUGATE DISTANCE	Infinite	Infinite			
DESIGN WAVELENGTH (note 1)	780nm	660nm	785nm	830nm	780nm
FOCAL LENGTH	4.516mm	4.476mm	4.516mm	8.01mm	7.003mm
WORKING / SOURCE DISTANCE	2.0mm	2.17mm	2.20mm	2.25mm	2.0mm
NUMERICAL APERTURE	0.476	0.476	0.476	0.368	0.389
CLEAR APERTURE	4.30mm	4.30mm	4.30mm	5.89mm	5.45mm
F#	1.05	1.04	1.05	1.36	1.28
FIELD SIZE DIAMETER	0.156mm	0.156mm	0.158mm	0.201mm	0.176mm
AR COATING DESIGN CENTER, MgF2	780nm	660nm	785nm	830nm	780nm
TRANSMISSION	>96%	>93%		>95%	>95%
COVER GLASS THICKNESS	1.2mm	0.25mm ~ 0.30mm			
COVER GLASS INDEX (n)	1.55	1.52023	1.51107	1.51097	45
CELL MATERIAL & FINISH	Aluminum / Black Anodized			Brass	
CELL DIMENSIONS (diameter x length)	Ø6.4mm x 4.85mm	Ø6.4mm x 6.3mm	Ø8mm x 11mm	Ø10mm x 10mm	

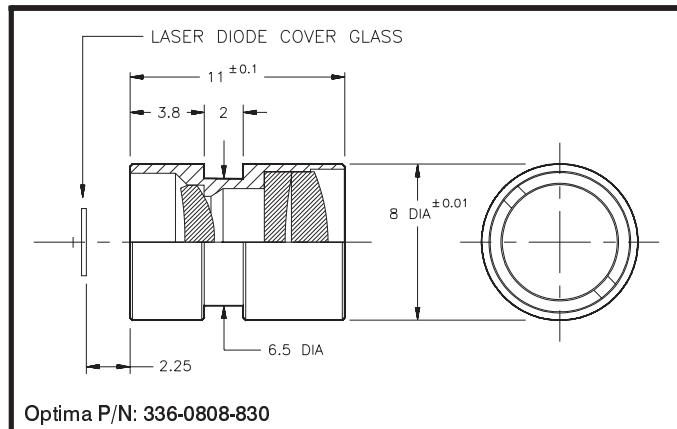
Notes: 1) In the specifications listed above, the design wavelength is used to calculate the focal length; however, this does not limit use of the lens to this particular wavelength — these lenses can be used with both near-infrared and visible laser diodes from 635nm through 850nm.



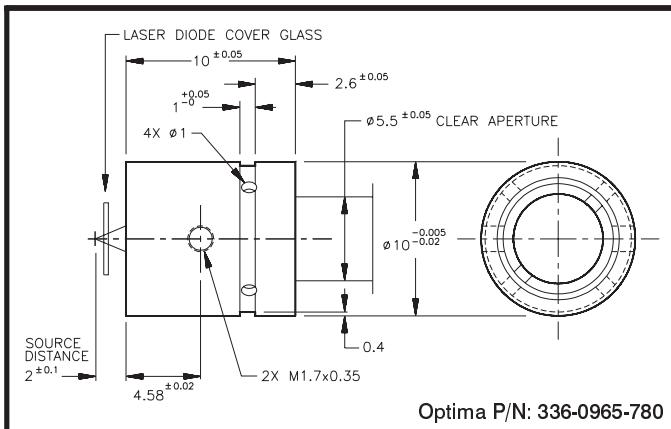
Optima P/N: 336-0000-780



Optima P/N: 336-1027-xxx



Optima P/N: 336-0808-830



Optima P/N: 336-0965-780

Revised 01JAN01

Optima® Molded Lass spheric Lenses

Diffraction-limited and very cost effective, a precision-molded glass aspheric lens is an attractive compromise between a multi-element lens and a molded plastic lens. The molded glass asphere has two basic advantages over a multi-element lens; first, the aspheric design reduces spherical aberration and coma in a single element; and second, overall light transmission is generally greater with fewer optical surfaces.

As compared with plastic lenses; molded glass aspheric lenses will operate over a much broader temperature and humidity range without performance degrading. Because of these advantages, molded glass lenses are often used in products such as laser printers, optical disc storage devices, and optical communications systems.

New Lens P/N305-0464- 80 — A larger numerical aperture is often very desirable when coupling a collimating lens with a laser diode. Our newest molded glass asphere P/N 305-0 6 - 0, has an NA of 0.5 and a focal length of mm which is ideally suited for many laser diode applications. With a 0.5 NA, a coupling efficiency over 90% can be achieved with most diodes. Detailed specifications are listed below:

Optima Molded Lass spheric Lens Specifications:

PART NUMBER	305-0065-780	305-0464-780	305-4606-670	305-8040-780
UNIT PRICE (Qty 1-49 pcs.)	\$16.40	\$14.60	\$17.00	\$21.85
DESCRIPTION	Collimating lens, Molded Glass Asphere, Unmounted			
CONJUGATE DISTANCE	Infinite			
DESIGN WAVELENGTH (note 1)	780nm	780nm	655nm	780nm
FOCAL LENGTH	6.25mm	4.00mm	4.60mm	8.00mm
WORKING / SOURCE DISTANCE	4.57mm	3.942mm	2.90mm	8.33mm
NUMERICAL APERTURE	0.40	0.50	0.53	0.25
CLEAR APERTURE	5.00mm	4.00mm	4.89mm	4.06mm
F#	1.25	1.00	0.94	1.97
FIELD SIZE DIAMETER	0.100mm	0.050mm	0.100mm	0.200mm
AR COATING DESIGN CENTER, MgF2	780nm		670nm	780nm
TRANSMISSION	>98%	>97%	>95%	>96%
COVER GLASS THICKNESS	0.25mm ~ 0.30mm		.275mm	0.25mm ~ 0.30mm
COVER GLASS INDEX (n)	1.511	1.50	1.510	1.500
TEMPERATURE RANGE	-20°C to +85°C			
LENS DIMENSIONS (diameter x length)	Ø6.38mm x 2.5mm	Ø6.40mm x 2.5mm	Ø6.00mm x 3.10mm	Ø6.40 x 2.5mm

Notes: 1) In the specifications listed above, the design wavelength is used to calculate the focal length; however, this does not limit use of the lens to this particular wavelength — these lenses can be used with both near-infrared and visible laser diodes from 635nm through 850nm.

Mounted aspheric lens with fine pitch threads — The popular 305-0065- 0 aspheric lens is available in three configurations: an unmounted single element, part number 305-0065- 0, and two convenient mounted lenses which help reduce some of the tedious problems associated with handling a very small lens. The 3 0-0065- 0 mount is a plain mm diameter aluminum cell that can be easily incorporated into the user's laser diode assembly. Lenses p/n 305-0 6 - 0, 305- 606-6 0, and p/n 305- 0 0- 0 are also available in a threaded mount, the p/n prefix changes to 306- - or 30 - - as listed in the table below. All of the threaded mounts have an etra-fine pitch thread (.3 5-6) on the outside diameter that facilitates precise control in adjusting the focus or collimation of a laser diode.

MOUNTED ASPHERIC LENS P/N	307-0464-780	306-0065-780	310-0065-780	307-4606-670	307-8040-780
UNIT PRICE (Qty 1-49 pcs.)	\$21.85	\$20.90	\$20.50	\$21.50	\$30.55
DESCRIPTION	Threaded Mount		Plain Cell	Threaded Mount	
CELL DIMENSIONS (diameter x length)	3/8-64 Thd. x 3.2mm		Ø8mm x 4.95mm	3/8-64 Thread x 4.95mm	

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Optima® In ection Molded Plastic spheric Lenses

While glass lenses are generally preferred, there are several product applications where a high quality plastic lens can be effectively utilized. The 300 series plastic aspheric collimating and objective lenses offer a lower cost alternative to glass and still perform well over a temperature range actually exceeding the upper limit for most laser diodes. Plastic lenses are used in products such as laser pointers, construction levels, and less critical alignment and position sensing devices.

New Lens, P/N300-0380- 80 creates a Smaller collimated beam — If you need a collimated beam with smaller dimensions, consider using the 300-0380-0 plastic lens and/or the Optima LD 500 T Laser Diodeounting it which includes the new smaller plastic asphere. As an example... when this lens is used with the Hitachi HL63 (635nm/5m²) laser diode, a collimated beam measures approximately 0.5 mm in the parallel axis by .5 mm in the perpendicular axis, with divergence angles of .1 mrad and 0.3 mrad respectively. (The figures mentioned may vary from one diode to another or, with other manufacturers diodes).

P/N300-0355-80 creates a Larger, More circular collimated beam — If you need a collimated beam with low divergence and consequently a smaller beam at long distances, consider the Optima 300-0395-0. With a long focal length (6mm) and small numerical aperture (NA .1) this lens creates a relatively large diameter beam that's more circular than the output from the typical laser diode collimating lens. Also, the 300-0395-0 lens is a very high-quality injection molded plastic lens this lens has been used in digital laser communication systems which are extremely sensitive to lens aberrations and diffraction patterns that can be misread as data when a beam sweeps across a detector. The only negative aspect of the lens might be the small NA the coupling efficiency (or total transmission) for most visible laser diodes is just under 50%. Please refer to the lens specifications below for detailed information.

For reference we've profiled the beam from a 300-0395-0 lens using a Hitachi HL63 laser diode; at 100 mm from the lens, a collimated beam measures 3.3 mm (.65 mm (measured at the 1/e² clip point, with 3.3 mm being the laser diode's parallel axis).

Optima In ection Molded Plastic spheric Lens Specifications:

PART NUMBER	300-0355-780	300-0360-780	300-0380-780	300-0395-780
UNIT PRICE (Qty 1-49 pcs.)	\$7.05	\$5.15	\$4.50	\$4.80
DESCRIPTION	Collimating lens, Injection Molded Plastic Asphere, Unmounted			
CONJUGATE DISTANCE	Infinite			
DESIGN WAVELENGTH (note 1)	780nm			
FOCAL LENGTH	4.50mm	4.50mm	3.40mm	16mm
WORKING / SOURCE DISTANCE	1.90mm	1.90mm	1.43mm	13.79mm
NUMERICAL APERTURE	0.50	0.45	0.471	0.144
CLEAR APERTURE	4.50mm	4.05mm	3.20mm	4.80mm
F#	1.00	1.11	1.06	1.67
FIELD SIZE DIAMETER	0.100mm	0.050mm	0.150mm	0.100mm
AR COATING DESIGN CENTER, MgF ₂	780nm			
TRANSMISSION	>98%	>97%	>95%	>97%
COVER GLASS THICKNESS	1.25mm			
COVER GLASS INDEX (n)	1.510	1.55	1.55	1.51
TEMPERATURE RANGE	Storage Temp. -30°C to +75°C, Working Temp. -10°C to +65°C			
LENS DIMENSIONS (diameter x length)	Ø7.4mm x 3.4mm	Ø7.4mm x 3.55mm	Ø5.0mm x 2.11mm	Ø6.5 x 2.33mm

Notes: 1) In the specifications listed above, the design wavelength is used to calculate the focal length; however, this does not limit use of the lens to this particular wavelength — these lenses can be used with both near-infrared and visible laser diodes from 635nm through 850nm.

MOUNTED PLASTIC LENS P/N	302-0355-780	302-0360-780	302-0380-780	302-0395-780
UNIT PRICE (Qty 1-49 pcs.)	\$13.25	\$11.15	\$13.55	\$12.60
CELL DIMENSIONS (diameter x length)	3/8-64 Thd. x 5.33mm		3/8-64 Thd. x 5.9mm	3/8-64 Thd. x 3.8mm

Revised 01JAN01



Diode Laser Modules DLM 3300 / 3500 / 3600

Other Diode Modules for OEM Product Applications



[DLM.PDF](#) (108K) Click on the file name to download an Adobe PDF file covering this section.

DLM 3300 / 3500 / 3600 Visible and Near-infrared with wavelengths from 635nm to 785nm and Optical Power ranging from 1mW to 35mW

Optima's Diode Laser Modules (DLM) combine the three essential components for any diode laser system: the laser diode, drive circuit, and collimating lens into a compact cylindrical package. Applications for Diode Laser Modules continue to expand into new areas including the following fields and products:

Industrial - Alignment, Positioning Systems, Edge Detection, and Distance Measuring

Scientific - Particle Counters, Light Scatter, Chemical Analysis and Fluorescence, Atomic Physics

Medical - Cell Counting, Blood Analysis, and Patient Positioning in Medical Imaging Systems

Graphic Arts - Laser Printers and Typesetting Equipment

Communication - Free Space Laser Communications

These applications, and many others, require high-quality components and workmanship. At Optima, we've designed and built-in that quality — we utilize our proprietary collimating optics and laser drive circuit. Attention to detail throughout manufacturing and assembly includes a 100% burn-in, environmental test sequence, and documentation. The final result creates a reliable diode laser module for the industrial, medical, and scientific community.

The module housing is precision machined from high strength 6061T-6 aluminum, providing a substantial heatsink for the laser diode, helping extend diode lifetime. The diode drive circuit operates the laser in the Continuous-wave (CW) and Automatic Power Control (APC) mode. Also referred to as the “photodiode feedback” mode, this closed-loop monitoring circuit uses the laser diodes internal photodiode as an optical power sensor. Current from the photodiode is fed back to the APC circuit, thereby regulating the drive current supplied to the laser diode. This circuit is generally recommended for stable optical power output in an environment where the ambient temperature will fluctuate. The laser drive circuit also includes ESD protection and reverse polarity protection; a slow-start circuit and filtering ensure power surges do not affect the laser diode. A green LED on the back of the module indicates when the laser diode is operating. (CDRH Class IIIb modules incorporate a three second turn-on delay).

Three basic modules are available — The DLM 3300 Series uses the Optima glass asphere P/N 305-0464-780 which provides a slightly smaller collimated beam than the two other modules. The DLM 3500 Series use an Optima glass aspheric collimating lens P/N 305-0065-780, while the DLM 3600 uses Optima's diffraction-limited, four-element glass collimating lens P/N 336-1027-660 lens for visible diodes, or the P/N 336-1027-785 lens for use with near-infrared diodes. All modules are supplied with a collimated beam; however, the lens is user-adjustable allowing the module to be focused at a specific distance. The approximate minimum focus distance for each module is listed in the specifications table below. For complete specifications on the collimating lenses, please refer to the [Laser Diode Optics](#) page.

The diode laser modules may be configured with a variety of laser diodes offering flexibility in design; optimizing the operating wavelength and output power for your specific application. Visible diode wavelengths range from 635nm to 690nm with laser diode power output ranging from 1mW to 35mW. A complete range of diode laser modules is listed below and in the Optima price list, along with the mechanical dimensions, diode specifications and the applicable CDRH classifications.

General Diode Laser Module Specifications:

Basic Model Number:	DLM 3300 Series	DLM 3500 Series	DLM 3600 Series
Collimating Lens:	Optima 305-0464-780 Glass Asphere	Optima 305-0065-780 Glass Asphere	Optima 336-1027-660 or 336-1027-785 Multi-element
Beam Divergence:	< 1.2mrad x 0.3mrad typical		< 1.2mrad x 0.3mrad typical
Static Alignment:	1 degree		< 5mrad
Minimum focus distance:	~ 10mm (note 4)	~ 24mm (note 4)	~ 14mm (note 4)
Typical spot size @ minimum distance:	~ 21.5 x 10.9 microns (1/e ²) (note 2)	~ 34.3 x 18.5 microns (1/e ²) (note 2)	~ 29.5 x 12.7 microns (1/e ²) (note 2)
Input Voltage:	+5 volts DC, regulated (note 3)	+4.5 to 7.0 volts DC, 5 volts DC recommended (note 1)	
Input Current:	< 200 mA (note 2)	60mA typical, 100mA maximum (note 2)	

Operating Mode:	Automatic Power Control (APC) Continuous-wave, with TTL control input	Automatic Power Control (APC) Continuous-wave
Operating Temperature:		-10°C ~ +50°C (note 2)
Storage Temperature:		-40°C ~ +80°C (note 2)
Mechanical Dimensions: diameter x length		Ø15mm x 50.8mm (Ø.591 inches x 2.00 inches)

Note 1) The optimum input voltage is +4.5 to 5.0 volts however, the modules will operate over a range from +4.5 to 7.0 volts. Using an input voltage greater than 5 volts results in excess heat which must be dissipated by the module. For best results when operating at increased input voltage or at elevated ambient temperatures, the module should be mounted using a metal mounting bracket or clamp to increase the thermal mass and facilitate heat transfer. In any case, the module should not be mounted in a plastic structure which inhibits heat transfer.

Note 2) Diode dependent specification.

Note 3) The DLM 3300 series require a +5VDC power supply that is filtered and well regulated (+0.5 / -0.25 volts).

Note 4) Distance measured from the front surface of the module to the focused spot.

DLM 3300 Series -- Part numbers and Prices:

Part Number	Unit price (Qty 1-4)	Laser Diode Part Number	Wavelength	Output Power	Typical 1/e ² Beam Size (mm)	CDRH Class
DLM 3305-645	\$194.00	DL3147-261	645nm	5mW	0.89 x 3.70	IIIb
DLM 3325-658	\$247.00	ML1016R	658nm	25mW	0.93 x 2.53	IIIb
DLM 3325-685	\$226.00	ML1012R	685nm	25mW	1.14 x 2.51	IIIb

DLM 3500 Series -- Part numbers and Prices:

Part Number	Unit price (Qty 1-4)	Laser Diode Part Number	Wavelength	Output Power	Typical 1/e ² Beam Size (mm)	CDRH Class
DLM 3504-635	\$218.00	DL3038-033	635nm	4mW	1.46 x 5.21	IIIa
DLM 3507-635	\$405.00	DL4038-031	635nm	7mW	1.44 x 4.98	IIIb
DLM 3504-650	\$189.00	TOLD9442M	650nm	4mW	1.36 x 5.00	IIIa
DLM 3504-671	\$194.00	TOLD9231M	670nm	4mW	2.11 x 5.15	IIIa

DLM 3507-671	\$258.00	TOLD9225M	670nm	7mW	1.39 x 4.59	IIIb
DLM 3505-785	\$195.00	ML44126N	785nm	5mW	1.87 x 5.11	IIIb

DLM 3600 Series -- Part numbers and Prices:

Part Number	Unit price (Qty 1-4)	Laser Diode Part Number	Wavelength	Output Power	Typical 1/e ² Beam Size (mm)	CDRH Class
DLM 3604-635	\$242.00	DL3038-033	635nm	4mW	1.05 x 4.18	IIIa
DLM 3607-635	\$435.00	DL4038-031	635nm	7mW		IIIb
DLM 3604-650	\$206.00	TOLD9442M	650nm	4mW	0.97 x 3.75	IIIa
DLM 3604-671	\$215.00	TOLD9231M	670nm	4mW	1.36 x 4.13	IIIa
DLM 3607-671	\$284.00	TOLD9225M	670nm	7mW	0.89 x 2.87	IIIb
DLM 3605-785	\$214.00	ML44126N	785nm	5mW	1.32 x 3.92	IIIb

Important notes regarding Laser Safety and CDRH Classifications:

Optima Diode Laser Modules, DLM 3500 Series and DLM 3600 Series are sold solely as components for O.E.M. use. The modules do not include a safety shutter, or other features required for a certified laser system. Therefore, these units may not meet CDRH safety requirements and are not CDRH listed or certified. It is the purchaser's responsibility to meet applicable federal regulations contained in Title 21 CFR parts 1000 and 1040.10 chapter 1, subchapter Radiological Health.

Laser Safety and CDRH Classifications:

CDRH Class II - CAUTION: Do not stare directly into the laser beam or a reflection from a mirror-like surface. Class II applies to visible lasers emitting laser light between 600nm and 700nm at 1mW or less.

CDRH Class IIIa - DANGER: Laser light can cause severe eye damage. Avoid direct eye exposure to the laser beam or a reflection from a mirror-like surface. Class IIIa applies to visible lasers emitting laser light between 600nm and 700nm at 5mW or less.

CDRH Class IIIb - DANGER: Laser light can cause severe eye damage. Avoid any exposure to the laser beam or a reflection from a mirror-like surface. Class IIIb applies to visible lasers emitting laser light between 600nm and 700nm at levels greater than 5mW; and invisible lasers (IR and near-IR) emitting radiation between 700nm to 900nm.

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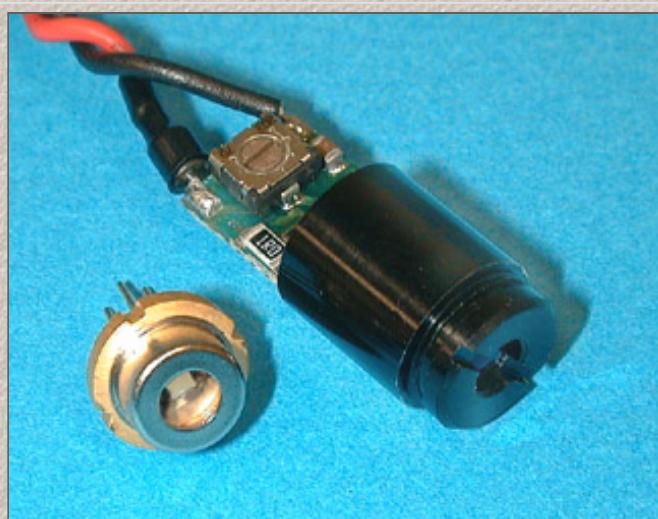
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Last modified: March 29, 2001



635nm and 650nm Diode Laser Modules for OEM Product Applications



[DLM_OEM.PDF](#) (107K) Click on the file name to download an Adobe PDF file covering this section.

General Description

- Cost effective, high quality, miniature diode laser module for OEM products
- Two highly visible wavelengths available – choose either 635nm or 650nm
- DLM 2100 Series uses an Optima molded plastic collimating lens for lower cost
- DLM 2300 Series uses an Optima molded glass asphere for better optical performance
- Adjustable lens for focusing or collimating the beam
- Adjustable optical power control – up to 3mW maximum output

These cost effective diode laser modules are specifically designed for high-volume OEM applications and are not intended to be used as a stand alone component. As shown in the above picture, the size of the diode housing is very small and the drive circuit is exposed for access to the power control. Therefore, these modules should be

Laser Diode Modules, Visible, 635nm and 650nm - Optima

incorporated into another product's housing or structure; one that will provide additional heat sinking for the laser diode and protection for the drive circuit.

These modules should not be confused with low-priced units imported from the Far East. While the cost is competitive, Optima's DLM 2100 and DLM2300 Series modules use only first quality components – and that's not just marketing hype. There are basically three essential components in a laser diode module:

First, the laser diode – we use only first quality 635nm and 650nm laser diodes from the major Japanese manufacturers like Hitachi and Toshiba. Other module manufacturers may use second or third grade diodes – in some cases the diodes fail the diode manufacturers first grade tests and are rejected without further testing – those diodes can wind-up in some module as untested, or perhaps used in modules with their photodiode lead clipped off.

Second, the optics – the Optima DLM 2100 Series is our lower cost module and it uses a molded plastic aspheric lens that will actually meet (or exceed) it's listed specifications over an operating temperature range that exceeds the operating temperature of the laser diode. Why is this important? If the collimating lens temperature range doesn't match or exceed the laser diodes temperature range, it's very likely the lens will be unstable. Subtle changes in the lens thickness or surface shape will cause the beam to change size and shape (usually it gets larger). It can also affect the beam's pointing stability, causing the beam to wander as the laser diode, module housing, and lens temperature increase.

For better optical performance, the Optima DLM 2300 Series module uses our high quality molded glass asphere. The glass lens is less sensitive to temperature fluctuations than a plastic lens and generally better suited for applications with a harsh environment. Also, visible birefringence and diffraction patterns are significantly reduced with a molded glass asphere.

Third, the drive circuit – we utilize only the best quality electrical components and SMT technology to produce a reliable and thoroughly tested circuit board assembly.

The specifications for the DLM 2100 Series and the DLM 2300 Series are basically the same and are listed in the table below. Both modules are shipped from the factory with the beam collimated and the optical power set to <1mW. The lens position can be adjusted by the user to provide a focused beam, a collimated beam, or a slightly divergent beam. The optical power may be adjusted by changing the potentiometer setting – to maximize the diodes lifetime, it's strongly recommended that a 3mW maximum optical power limit is not exceeded, (see note 1 below).

Mechanical dimensions and general specifications for the modules are listed below:

Basic Model Number:	DLM 2100 Series		DLM 2300 Series	
Module P/N	DLM 2103-636	DLM 2103-650	DLM 2303-636	DLM 2303-650
Unit Price (Qty. 1-24 pcs.)	\$54.00	\$35.50	\$63.00	\$43.80
Optical Characteristics:				
Optical Output Power	3mW (please read notes 1&3 below)			
Typical Wavelength	635nm	650nm	635nm	650nm
Collimating Lens:	Plastic Asphere Optima 300-0360-780		Glass Asphere Optima 305-0065-780	

Typical Collimated Beam Size (note 5)	1.02mm x 2.94mm	0.91mm x 3.02mm	1.37mm x 3.37mm	1.26mm x 3.37mm
Typical Focused Beam Size (note 6)	~ 10 x 25 microns	~ 18 x 28 microns	~ 15 x 28 microns	17 x 30 microns
Minimum Focus Distance	18mm	18mm	40mm	40mm
Electrical and Mechanical Characteristics:				
Input Voltage:	+3.0 to 5.0 volts DC, +3 volts DC recommended (note 2)			
Input Current:	40mA typical for 650nm module (note 4)			
Operating Mode:	Automatic Power Control (APC) Continuous-wave			
Operating Temperature:	-10°C ~ +50°C for 635nm module (note 4)			
Storage Temperature:	-40°C ~ +80°C (note 4)			
Mechanical Dimensions: diameter x length	Diode housing Ø10mm x 12.5mm (Ø.394 inches x .49 inches) Overall length including PCB 21.5mm (0.85 inches), wire leads 75mm (3 inches)			

Note 1) The maximum optical output power is 3mW. Each module is tested at the factory, the beam is collimated and the optical output set between 0.95mW and 1mW with an input voltage of +3.0 volts. The optical power may be adjusted by the user; however, a maximum optical output of 3mW must not be exceeded – an optical power meter is required to accurately set the optical output. Exceeding the 3mW limit will severely shorten the diodes lifetime and/or may cause immediate failure. Refer to the [application notes and glossary](#) section if you need clarification on laser lifetime, power settings, failure modes, etc.

Note 2) The optimum input voltage is +3.0 volts; however, the modules will operate over a range from +3.0 to 5.0 volts. Using an input voltage greater than 3 volts results in excess heat which must be dissipated by the module. For best results when operating at increased input voltage or at elevated ambient temperatures, the module should be mounted using a metal mounting bracket or clamp to increase the thermal mass and facilitate heat transfer. In any case, the module should not be mounted in a plastic structure which inhibits heat transfer.

Note 3) The optical output power is directly related to the input voltage. If the input power is increased, the optical output will increase. Therefore using an optical power meter, the optical power must be set with the module operating at the highest anticipated input voltage. For operation at a constant output level, the supply voltage should be regulated. If desired, the optical output may be controlled externally by varying the input or supply voltage.

Note 4) Diode dependent specification -- values will vary from one diode module to another.

Note 5) The collimated beam is measured at the $1/e^2$ point. The first number (smaller value) is the laser diodes parallel axis while the second number is the perpendicular axis. The values listed are typical and may vary from diode to diode.

Note 6) The focused beam is measured at the $1/e^2$ point. This measurement is taken at the minimum focus distance as listed in the table above -- the distance is measured from the front of the module housing to the focused spot. The first number (smaller value) is the laser diodes perpendicular axis while the second number is the parallel axis. The values listed are typical and may vary from diode to diode.

Important notes regarding Laser Safety and CDRH Classifications:

Optima Diode Laser Modules, DLM 2100 Series and DLM 2300 Series are sold solely as components for O.E.M. use. The modules do not include a laser emission indicator, safety shutter, or other features required for a certified laser system. Therefore, these units do not meet CDRH safety requirements and are not CDRH listed or certified. It is the purchaser's responsibility to meet applicable federal regulations contained in Title 21 CFR parts 1000 and 1040.10 chapter 1, subchapter Radiological Health.

Laser Safety and CDRH Classifications:

CDRH Class II - CAUTION: Do not stare directly into the laser beam or a reflection from a mirror-like surface. Class II applies to visible lasers emitting laser light between 600nm and 700nm at 1mW or less.

CDRH Class IIIa - DANGER: Laser light can cause severe eye damage. Avoid direct eye exposure to the laser beam or a reflection from a mirror-like surface. Class IIIa applies to visible lasers emitting laser light between 600nm and 700nm at 5mW or less.

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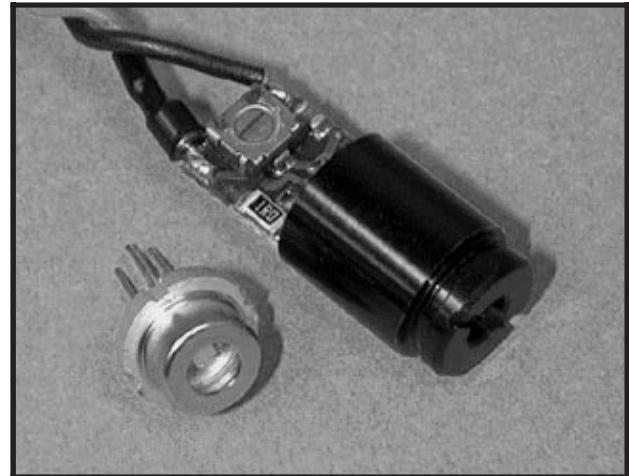
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Last modified: December 30, 2000

pi a a d Diode Laser od es for pp i a io s

- Cost effective, high quality, miniature diode laser module for OEM products
- Two highly visible wavelengths available – choose either 635nm or 650nm
- DLM 100 Series uses an Optima molded plastic collimating lens for lower cost
- DLM 300 Series uses an Optima molded glass asphere for better optical performance
- Adjustable lens for focusing or collimating the beam
- Adjustable optical power control up to 3mW maximum output



These cost effective diode laser modules are specifically designed for high-volume OEM applications and are not intended to be used as a stand alone component. As shown in the above picture, the size of the diode housing is very small and the drive circuit is exposed for access to the power control. Therefore, these modules should be incorporated into another product's housing or structure; one that will provide additional heat sinking for the laser diode and protection for the drive circuit.

While the cost is competitive, Optima's DLM 2100 and DLM 2300 Series modules use only first quality components:

First, the laser diode we use only first quality 635nm and 650nm laser diodes from the major Japanese manufacturers like Hitachi and Toshiba. Other module manufacturers may use second or third grade diodes – in some cases the diodes fail the diode manufacturers first grade tests and are rejected without further testing – those diodes can wind-up in modules as untested or perhaps used in modules with their photodiode lead clipped off.

Second, the optics the Optima DLM 2100 Series is our lower cost module and it uses a molded plastic aspheric lens that will actually meet (or exceed) its listed specifications over an operating temperature range that exceeds the operating temperature of the laser diode. Why is this important? If the collimating lens temperature range doesn't match or exceed the laser diodes temperature range, it's very likely the lens will be unstable. Subtle changes in the lens thickness or surface shape will cause the beam to change size and shape (usually it gets larger). It can also affect the beam's pointing stability, causing the beam to wander as the laser diode, module housing, and lens temperature increase.

For better optical performance, the Optima DLM 2300 Series module uses our high quality molded glass asphere. The glass lens is less sensitive to temperature fluctuations than a plastic lens and generally better suited for applications with a harsh environment. Also, visible birefringence and diffraction patterns are significantly reduced with a molded glass asphere.

Third, the drive circuit we utilize only the best quality electrical components and SMT technology to produce a reliable and thoroughly tested circuit board assembly.

The specifications for the DLM 2100 Series and the DLM 2300 Series are basically the same and are listed in the table on the following page. Both modules are shipped from the factory with the beam collimated and the optical power set to <1mW. The lens position can be adjusted by the user to provide a focused beam, a collimated beam, or a slightly divergent beam. The optical power may be adjusted by changing the potentiometer setting – to maximize the diodes lifetime, it's strongly recommended that a 3mW maximum optical power limit is not exceeded, (see note 1 below).

Revised 01JAN01

Mechanical dimensions and general specifications are listed below:

BASIC SERIES NUMBER	DLM 2100 Series		DLM 2300 Series	
Module Part Number	DLM 2103-636	DLM 2103-650	DLM 2303-636	DLM 2303-650
Unit Price (Qty 1-24 pcs.)	\$54.00	\$35.50	\$63.00	\$43.80
OPTICAL CHARACTERISTICS				
Optical Output Power	3mW (please read notes 1&3 below)			
Typical Wavelength	635nm	650nm	635nm	650nm
Collimating Lens	Plastic Asphere Optima P/N 300-0360-780		Glass Asphere Optima P/N 305-0065-780	
Collimated Beam Size (note 5)	1.02mm x 2.94mm	0.91mm x 3.02mm	1.37mm x 3.37mm	1.26mm x 3.37mm
Focused Beam Size (note 6)	~10 x 25 microns	~18 x 28 microns	~15 x 28 microns	~17 x 30 microns
Minimum Focus Distance	18mm	18mm	40mm	40mm
ELECTRICAL AND MECHANICAL CHARACTERISTICS				
Input Voltage	+3.0 to 5.0 volts DC, +3 volts DC recommended (note 2)			
Input Current	60mA typical for 635nm module (note 4)			
	40mA typical for 650nm module (note 4)			
Operating Mode	Automatic Power Control (APC) Continuous-wave (CW)			
Operating Temperature	-10°C ~ +50°C for 635nm module (note 4)			
	-10°C ~ +60°C for 650nm module (note 4)			
Storage Temperature	-40°C ~ +80°C (note 4)			
Mechanical Dimensions (diameter x length)	Diode Housing Ø10mm x 12.5mm (Ø.394 inches x 0.49 inches) Overall length including PCB 21.5mm (0.85 inches), wire leads 75mm (3 inches)			

Note 1) The maximum optical output power is 3mW. Each module is tested at the factory, the beam is collimated and the optical output set between 0.95mW and 1mW with an input voltage of +3.0 volts. The optical power may be adjusted by the user; however, a maximum optical output of 3mW must not be exceeded — an optical power meter is required to accurately set the optical output. Exceeding the 3mW limit will severely shorten the diodes lifetime and/or may cause immediate failure.

Note 2) The optimum input voltage is +3.0 volts; however, the modules will operate over a range from +3.0 to 5.0 volts. Using an input voltage greater than 3 volts results in excess heat which must be dissipated by the module. For best results when operating at increased input voltage or at elevated ambient temperatures, the module should be mounted using a metal mounting bracket or clamp to increase the thermal mass and facilitate heat transfer. In any case, the module should not be mounted in a plastic structure which inhibits heat transfer.

Note 3) The optical output power is directly related to the input voltage. If the input power is increased, the optical output will increase. Therefore using an optical power meter, the optical power must be set with the module operating at the highest anticipated input voltage. For operation at a constant output level, the supply voltage should be regulated. If desired, the optical output may be controlled externally by varying the input or supply voltage.

Note 4) Diode dependent specification — values will vary from one diode module to another.

Note 5) The collimated beam is measured at the 1/e2 point. The first number (smaller value) is the laser diodes parallel axis while the second number is the perpendicular axis. The values listed are typical and may vary from diode to diode.

Note 6) The focused beam is measured at the 1/e2 point. This measurement is taken at the minimum focus distance as listed in the table above — the distance is measured from the front of the module housing to the focused spot. The first number (smaller value) is the laser diodes perpendicular axis while the second number is the parallel axis. The values listed are typical and may vary from diode to diode.

Important notes regarding Laser Safety and CDRH Classifications: Optima Diode Laser Modules, DLM 2100 Series and DLM 2300 Series are sold solely as components for O.E.M. use. The modules do not include a laser emission indicator, safety shutter, or other features required for a certified laser system. Therefore, these units do not meet CDRH safety requirements and are not CDRH listed or certified. It is the purchaser's responsibility to meet applicable federal regulations contained in Title 21 CFR parts 1000 and 1040.10 chapter 1, subchapter Radiological Health.

Optima Diode Laser Modules

Visible and Near-IR Wavelengths from 635nm to 850nm and Optical Power from 1mW to 35mW

Optima's Diode Laser Modules (DL) combine the three essential components for any diode laser system: the laser diode, drive circuit, and collimating lens into a compact cylindrical package. Applications for Diode Laser Modules continue to expand into new areas including the following fields and products:

- Industrial - Alignment, Positioning Systems, Edge Detection, and Distance Measurement
- Scientific - Particle Counters, Light Scatter, Chemical Analysis and Fluorescence, Atomic Physics
- Medical - Cell Counting, Blood Analysis, and Patient Positioning in Medical Imaging Systems
- Graphic Arts - Laser Printers and Typesetting Equipment



These applications, and many others, require high-quality components and workmanship. At Optima, we've designed and built-in that quality — we utilize our proprietary collimating optics and laser drive circuit. Attention to detail throughout manufacturing and assembly includes a 100-hour burn-in, environmental test sequence, and documentation. The final result creates a reliable diode laser module for the industrial, medical, and scientific community.

The module housing is precision machined from high strength 6061-T6 aluminum, providing a substantial heatsink for the laser diode, helping extend diode lifetime. The diode drive circuit operates the laser in the continuous-wave (CW) and Automatic Power Control (APC) mode. Also referred to as the photodiode feedback mode, this closed-loop monitoring circuit uses the laser diodes internal photodiode as an optical power sensor. Current from the photodiode is fed back to the APC circuit, thereby regulating the drive current supplied to the laser diode. This circuit is generally recommended for stable optical power output in an environment where the ambient temperature will fluctuate. The laser drive circuit also includes short-circuit protection and reverse polarity protection; a slow-start circuit and filtering ensure power surges do not affect the laser diode. A green LED on the back of the module indicates when the laser diode is operating. (DHL class modules incorporate a three second turn-on delay).

Three basic modules are available — The DL 3300 series uses the Optima glass asphere P/N 305-061-0 which provides a slightly smaller beam than the two other modules. The DL 3500 series use an Optima glass aspheric collimating lens P/N 305-0065-0, while the DL 3600 uses Optima's diffraction-limited, four-element glass collimating lens P/N 336-0660 lens for visible diodes, or the P/N 336-0655 lens for use with near-infrared diodes. All modules are supplied with a collimated beam; however, the lens is user-adjustable having a minimum focus distance of about 100 mm from the front surface of the DL housing. For complete specifications on the collimating lenses, please refer to the Laser Diode Optics page at the Optima website — <http://www.optima-optics.com>

The diode laser modules may be configured with a variety of laser diodes offering flexibility in design; optimizing the operating wavelength and output power for your specific application. Visible diode wavelengths range from 635nm to 655nm with laser diode power output ranging from 1mW to 35mW. A complete range of diode laser modules is listed on the following page and in the Optima price list, along with the mechanical dimensions, diode specifications and the applicable DHL classifications.

Optima Diode Laser Modules — DLM 33/35/3600 Series

DLM 3300 SPECIFICATIONS:

Collimating Lens: Optima 305-0464-780 molded glass asphere
Beam Divergence: < 1.2 mrad x 0.3 mrad
Static Alignment: < 1°
Input Voltage: +5 VDC, regulated, +0.5 / -0.25 VDC
Input Current: < 200mA *

Operating Mode: CW, Automatic Power Control (APC) with TTL Control Input
Operating Temperature: -10° ~ +50° C *
Storage Temperature: -40° ~ +80° C
Mechanical dimensions (Dia. x Length): Ø15mm x 50.8mm (Ø.590" x 2.00")
 * Diode dependent specification

PART NUMBER	LASER DIODE PART NUMBER	WAVELENGTH (nm)	MAX OUTPUT POWER (mW)	CDRH CLASS	TYPICAL 1/e ² BEAMSIZE (mm)	MODE	PRICE
DLM 3305-645	DL3147-261	645	5	IIIb	0.89 x 3.70	Single	\$194.00
DLM 3325-658	ML1016R	658	25	IIIb	0.93 x 2.53	Single	247.00
DLM 3325-685	ML1412R	685	25	IIIb	1.14 x 2.51	Single	266.00
DLM 3335-685	ML1013R	685	35	IIIb	1.05 x 2.87	Single	247.00

DLM 3500 SPECIFICATIONS:

Collimating Lens: Optima 305-0065-780 molded glass asphere
Beam Divergence: < 1.2 mrad x 0.3 mrad
Static Alignment: < 1°
Input Voltage: +4.5 to 7.0 VDC, +5 VDC recommended
Input Current: 60mA typical, 100mA maximum *

Operating Mode: Automatic Power Control (APC) Continuous-Wave
Operating Temperature: -10° ~ +50° C *
Storage Temperature: -40° ~ +80° C
Mechanical dimensions (Dia. x Length): Ø15mm x 50.8mm (Ø.590" x 2.00")
 * Diode dependent specification

PART NUMBER	LASER DIODE PART NUMBER	WAVELENGTH (nm)	MAX OUTPUT POWER (mW)	CDRH CLASS	TYPICAL 1/e ² BEAMSIZE (mm)	MODE	PRICE
DLM 3504-635	DL3038-033	635	4	IIIa	1.46 x 5.21	Single	\$218.00
DLM 3507-635	DL4038-031	635	7	IIIb	1.44 x 4.98	Single	405.00
DLM 3504-650	TOLD9442M	670	4	IIIa	1.36 x 5.00	Single	189.00
DLM 3504-671	TOLD9231M	670	4	IIIa	2.11 x 5.15	Multi	194.00
DLM 3507-671	TOLD9225M	670	7	IIIb	1.39 x 4.59	Single	258.00
DLM 3505-785	ML44126N	785	5	IIIb	1.87 x 5.11	Single	195.00

DLM 3600 SPECIFICATIONS:

Collimating Lens: Optima 336-1027-660 or -785, diffraction limited
Beam Divergence: < 1.2 mrad x 0.3 mrad
Static Alignment: < 5 mrad
Input Voltage: +4.5 to 7.0 VDC, +5 VDC recommended
Input Current: 60mA typical, 100mA maximum *

Operating Mode: Automatic Power Control (APC) Continuous-Wave
Operating Temperature: -10° ~ +50° C *
Storage Temperature: -40° ~ +80° C
Mechanical dimensions (Dia. x Length): Ø15mm x 50.8mm (Ø.590" x 2.00")
 * Diode dependent specification

PART NUMBER	LASER DIODE PART NUMBER	WAVELENGTH (nm)	MAX OUTPUT POWER (mW)	CDRH CLASS	TYPICAL 1/e ² BEAMSIZE (mm)	MODE	PRICE
DLM 3604-635	DL3038-033	635	4	IIIa	1.05 x 4.18	Single	\$242.00
DLM 3607-635	DL4038-031	635	7	IIIb		Single	435.00
DLM 3604-650	TOLD9442M	650	4	IIIa	0.97 x 3.75	Single	206.00
DLM 3604-671	TOLD9231M	670	4	IIIa	1.36 x 4.13	Multi	215.00
DLM 3607-671	TOLD9225M	670	7	IIIb	0.89 x 2.87	Single	284.00
DLM 3605-785	ML44126N	785	5	IIIb	1.32 x 3.92	Single	214.00



Collimated Diode Lasers



What exactly is a Collimated Diode Laser? A Collimated Diode Laser (CDL) is a compact cylindrical assembly often referred to as a light pen. Each CDL includes; a laser diode and collimating lens which are assembled into a precisely machined, black anodized, aluminum housing; the laser diode drive circuit is not included. CDL's are often a viable solution in the following situations:

- **Optical assembly techniques and specialized optical test instruments are not available**
- **Laser drive circuit is incorporated with other electronics in the product or application**
- **Special laser drive requirements; i.e. pulse drive or modulation**

Optima offers a comprehensive selection of CDL assemblies based on the seven laser diode mounting systems described on the [Laser Diode Mounting Kit](#) page. Combining these proprietary mounting systems with the myriad of laser diodes available today allows us to efficiently assemble a CDL specifically tailored to your requirements.

In critical applications, a CDL with an x-y lens alignment system is generally preferred. During the assembly process, the optical axis of the collimating lens is precisely aligned with the laser diode's emission point, ensuring a symmetric beam with better static alignment. The collimating lens is then adjusted in the z-axis to focus or collimate the beam.

Test data is provided with all CDL's listing specific characteristics of the laser diode, drive current required at various power levels, and the beam divergence specifications.

A partial listing of the CDL units available is included in the current Optima price list. Many [laser diodes](#) are available from our stock and inquiries with special requirements such as custom mounts or special optical requirements are welcome.

Collimated or Focused Laser Diodes, 635nm to 850nm, 3mW to 50mW, - Optima

Send mail to webmaster@optima-optics.com with questions or comments about this web site.

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OPTIMA®

Ophir PD200 Optical Power Meter New Low Price Includes Two Calibrated Wavelengths



When you're working with laser diodes, you really should use an optical power meter – it's not just a matter of convenience.



[PD200.PDF](#) (71K) Click on the file name to download an Adobe PDF file covering this section.

At Optima we're often asked to recommend an optical power meter for general purpose use... Whether it's for use in the R&D lab, a production environment, or for servicing laser products in the field, the Ophir model PD200 is a cost effective solution for measuring one or two specific laser wavelengths.



What makes PD200 unique is it's straightforward simplicity – with only three basic controls, there's no elaborate set-up or calibration procedure required – just turn on the power, select the correct wavelength and power range, and you're ready to make measurements up to 200mW.



The large 3-1/2 digit LCD display has exceptionally good contrast and can be back-lit for improved viewing in low light situations.



The PD200 is completely portable – the display unit has a built-in rechargeable battery that lasts approximately 30 hours between charging cycles, and the system includes a 12 volt wall-mounted power supply/charger.

The PD200 utilizes a calibrated, large area silicon photodiode for measuring optical power. The photodiode's calibration data is stored in the photodiode assembly and each PD200 sensor is calibrated for two specific wavelengths. The user may select either wavelength (WL1 or WL2) with a rocker switch on the front panel. The factory calibrated wavelengths available are listed in the specifications table below. Also, a photodiode response curve is supplied with each meter, which will allow the user to extrapolate to other nearby wavelengths.

The display housing is injection molded plastic while the photodiode sensor is mounted in a machined aluminum housing with a convenient swivel head. We've found the swivel head has two subtle benefits; in confined spaces it often helps to accurately position the detector. Likewise, when the sensor head is used with standard optical bench holders, the swivel head makes it easy to tilt the head slightly – reducing unwanted back reflections into the laser source. An optional stand (as shown in the picture above) is also available for the detector.

Application note: Are you considering one of the new hand-held power meter probes? A self-contained probe may be cheaper and appear to offer convenience; however, please consider this... We've found in most applications we keep the sensor head mounted on an optical bench post and/or stand. The sensor head can easily be placed in the beam that's being measured and your hands are free for making adjustments to the optics or electronics. Unless you have a few extra hands, it's very difficult to keep a sensor accurately positioned in the beam while making adjustments and reading a display.

PD200 Optical Power Meter Specifications:

Model Number:	PD200
Spectral Range:	400 to 1100nm
Sensor calibration available for two wavelengths:	488, 514, 633, 650, 660, 670, 675, or 780nm
Maximum Power:	200mW
Power Ranges	199.9mW, 19.99mW, 1.999mW, 199.9 μ W, 19.99 μ W, 1.999 μ W
Accuracy at Calibrated Wavelengths:	\pm 3%
Sensor Aperture:	10mm diameter
Linearity:	\pm 1%
Beam Position Dependency:	\pm 1% across detector area
Noise Level:	1 nanowatt
Response Time:	1 second
Maximum Pulse Energy:	500 μ J
Damage Threshold:	10W/cm ²
Sensor Head Dimensions (LxWxD):	100mm x Ø30mm x 15mm (3.94 x Ø1.18 x 0.59 inches)
Sensor Cable Length:	2 meters (78.7 inches)
Display Housing Dimensions (LxWxD):	175mm x 85mm x 35mm (6.90 x 3.35 x 1.38 inches)

Controls:	Power on-off switch, wavelength select switch WL1 or WL2, 6 decade range selector switch, display backlight switch, zero adjustment.
Operating Temperature:	10°C to 30°C
Unit Price:	\$439.00 each – includes the display unit, photodiode sensor calibrated for two wavelengths, and a 12 volt wall-mounted power supply/charger.
Options Available and Unit Price:	Detector stand and clamp as shown in picture \$55.00 each

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When you're working with laser diodes, you really should use an optical power meter – it's not just a matter of convenience.

At Optima we're often asked to recommend an optical power meter for general purpose use... Whether it's for use in the R&D lab, a production environment, or for servicing laser products in the field, the Ophir model PD200 is a cost effective solution for measuring one or two specific laser wavelengths.

What makes PD200 unique is its straightforward simplicity – with only three basic controls, there's no elaborate set-up or calibration procedure required – just turn on the power, select the correct wavelength and power range, and you're ready to make measurements up to 200mW.

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The display housing is injection molded plastic while the photodiode sensor is mounted in a machined aluminum housing with a convenient swivel head. We've found the swivel head has two subtle benefits; in confined spaces it often helps to accurately position the detector. Likewise, when the sensor head is used with standard optical bench holders, the swivel head makes it easy to tilt the head slightly – reducing unwanted back reflections into the laser source. An optional stand (as shown in the picture above) is also available for the detector.

Application note: Are you considering one of the new hand-held power meter probes? A self-contained probe may be cheaper and appear to offer convenience; however, please consider this... We've found in most applications we keep the sensor head mounted on an optical bench post and/or stand. The sensor head can easily be placed in the beam that's being measured and your hands are free for making adjustments to the optics or electronics. Unless you have a few extra hands, it's very difficult to keep a sensor accurately positioned in the beam while making adjustments and reading a display.

PD 200 Optical Power Meter Specifications:

Model Number: PD200

Spectral Range: 400 to 1100nm

Sensor calibration available for two wavelengths: 488, 514, 633, 650, 660, 670, 675, or 780nm

Maximum Power: 200mW

Power Ranges: 199.9mW, 19.99mW, 1.999mW, 199.9μW, 19.99μW, 1.999μW

Accuracy at Calibrated Wavelengths: ± 3%

Sensor Aperture: 10mm diameter

Linearity: ± 1%

Beam Position Dependency: ± 1% across detector area

Noise Level: 1 nanowatt

Response Time: 1 second

Maximum Pulse Energy: 500μJ

Damage Threshold: 10W/cm²

Sensor Head Dimensions (LxWxD): 100mm x Ø30mm x 15mm (3.94 x Ø1.18 x 0.59 inches)

Sensor Cable Length: 2 meters (78.7 inches)

Display Housing Dimensions (LxWxD): 175mm x 85mm x 35mm (6.90 x 3.35 x 1.38 inches)

Controls: Power on-off switch, wavelength select switch WL1 or WL2, 6 decade range selector switch, display backlight switch, zero adjustment.

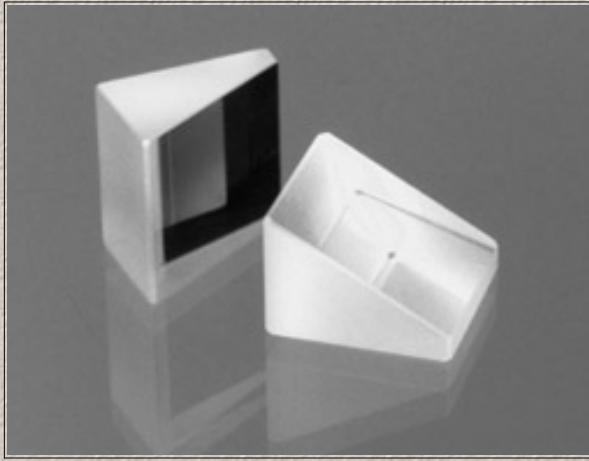
Operating Temperature: 10°C to 30°C

Unit Price: \$439.00 each – includes the display unit, photodiode sensor calibrated for two wavelengths, and a 12 volt wall-mounted power supply/charger. Options Available and Unit Price: Detector stand and clamp as shown in picture \$55.00 each

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Anamorphic Prisms



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Beam Shaping and Circularization for Laser Diodes

Anamorphic prisms are used to change the dimension of a beam in one axis, the effect being analogous to that of a cylindrical lens. Depending on the orientation of the prisms, the beam size may be either reduced or expanded and the amount of change is variable depending on the angular position of the prisms.

The output from most laser diodes is elliptical in cross-section, even after collimation. Depending on the type of laser diode, the aspect ratio of the elliptical beam might be as small as 2:1 or as large as 5:1. In many applications the elliptical beam shape might be useable or even desirable; however, other applications may require beam shaping or circularization. If beam shaping is required, a system using a pair of anamorphic prisms has three significant benefits. One, a pair of prisms can be designed into a much more compact package than a telescope using cylindrical optics. Secondly, the ability of adjusting the position of the prisms allows the user to compensate for variations from one diode to another. And third, the prisms are more cost effective than cylindrical lenses of comparable quality.

To modify the beam from a laser diode, the anamorphic prisms are inserted into the beam path after the laser diode is collimated. Magnification is controlled by the angular position of the prisms with respect to the incoming beam and like a telescope, the prism system can be reversed to reduce the beam rather than expand the beam. The prisms are unmounted, allowing the user to position each prism independently as required.

Price (Qty 1- 4 pair) \$89.25 per pair

Part Numbers and Specifications:

Description	Anamorphic Prism Pair	AR Coating Center Wavelength and Recommended Range
Part Number	420-1212-633	633nm (recommended range 532nm to 690nm)
	420-1212-830	830nm (recommended range 780nm to 980nm)
Material	SF 11	
Flatness	lambda/8 at 830nm across clear aperture	
Scratch & Dig	60/40	
Finish	Sides fine ground with edges beveled	
Dimensions	12mm x 12mm x 8.5mm, Prism angle = 29°26'	
Tolerances	Linear ± 0.1mm, Angular <5 minutes	

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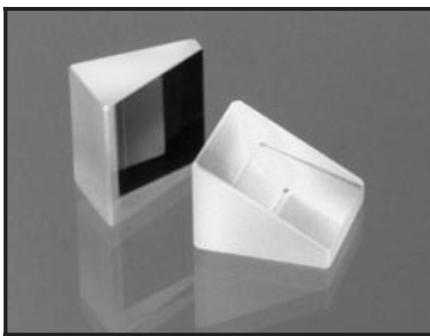
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p i a a o r p i r i s s

beam Shaping and Circularization for Laser Diodes



Anamorphic prisms are used to change the dimension of a beam in one axis, the effect being analogous to that of a cylindrical lens. Depending on the orientation of the prisms, the beam size may be either reduced or expanded and the amount of change is variable depending on the angular position of the prisms.

The output from most laser diodes is elliptical in cross-section, even after collimation. Depending on the type of laser diode, the aspect ratio of the elliptical beam might be as small as 1:2 or as large as 5:1. In many applications the elliptical beam shape might be useable or even desirable; however, other applications may require beam shaping or circularization. If beam shaping is required, a system using a pair of anamorphic prisms has three significant benefits: one, a pair of prisms can be designed into a much more compact package than a telescope using cylindrical optics; secondly, the continuous range of adjustment allows the user to compensate for variations from one diode to another; and third, the prisms are more cost effective than cylindrical lenses of comparable quality.

To modify the beam from a laser diode, the anamorphic prisms are inserted into the beam path after the laser diode is collimated. Nominal placement for the prisms is shown in Figure 1. Magnification is controlled by the angular position of the prisms with respect to the incoming beam and Table 1 lists the linear and angular dimensions of the prisms for various magnifications. Like a telescope, the prism system can be reversed to reduce the beam rather than expand the beam. The prisms are unmounted, allowing the user to position each prism independently as required.

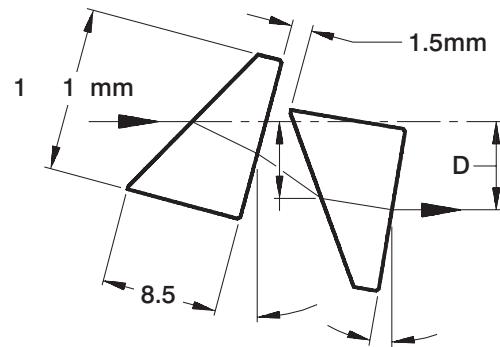


Figure 1: Nominal Placement

Table 1: Anamorphic Magnification

Magnification Factor	Prism Angles A (deg)	Prism Angles B (deg)	Displacement C (mm)	Displacement D (mm)
2.0	21.2	6.0	5.1	5.3
2.2	23.8	4.3	5.4	5.6
2.4	25.8	2.9	5.7	5.8
2.6	27.6	1.8	6.0	6.0
2.8	29.1	0.9	6.2	6.2
3.0	30.4	0.1	6.4	6.4
3.2	31.6	-0.6	6.6	6.5
3.4	32.7	-1.1	6.7	6.7
3.6	33.6	-1.6	6.9	6.8
3.8	34.4	-2.1	7.0	6.9
4.0	35.2	-2.5	7.1	7.0
4.2	35.9	-2.8	7.2	7.1
4.4	36.6	-3.1	7.3	7.2
4.6	37.2	-3.4	7.4	7.3
4.8	37.7	-3.7	7.5	7.3
5.0	38.2	-3.9	7.6	7.4
5.2	38.7	-4.1	7.6	7.5
5.4	39.2	-4.3	7.7	7.5
5.6	39.6	-4.5	7.8	7.6
5.8	40.0	-4.7	7.8	7.6
6.0	40.4	-4.8	7.9	7.7

Note: Special prism sizes and A coatings are available in O quantities, quotations upon request.

Anamorphic Prism Part Numbers and Specifications:

Description:	Anamorphic Prism Pair
Part Number:	420-1212-633 – AR coating for 633nm (recommended range 633nm to 690nm) 420-1212-830 – AR coating for 830nm (recommended range 780nm to 980nm)
Material:	SF11 grade A fine annealed
Flatness:	$\lambda/8$ at 830nm across clear aperture
Scratch & Dig:	60/40
Finish:	Sides fine ground with edges beveled
AR Coating:	MgF_2 on perpendicular surface at the specified wavelength
Dimensions:	12mm x 12mm x 8.5mm, Angle = $29^\circ 26'$
Tolerances:	Linear ± 0.1 mm, Angular < 5 minutes

Revised01JAN01

What is a Laser Diode How Does it Work

Terms Describing Laser Diode Absolute Maximum Ratings:

Commonly used abbreviations are shown in parentheses.

Case Temperature (T_c) – Device temperature measured at the base of the package.

Operating Temperature (T_{opr}) – Range of case temperatures within which the device may be safely operated.

Optical Power Output (P_o) – Maximum allowable instantaneous optical power output in either continuous (CW) or pulse operation. Up to this point, there are no kinks in the optical power output vs. forward current curve.

Important note: The optical power output specification is applicable to the bare laser diode – it does not allow for, or take into consideration, any optics that may be in the optical path, such as a collimating lens located between the laser diode and a power meter or other detector.

Caution: Do not exceed the specified optical power output — even an instantaneous (less than a nanosecond) application of excessive current or voltage may cause deterioration or catastrophic optical damage (COD) to the facets.

Reverse Voltage (V_R) – Maximum allowable voltage when reverse bias is applied to the laser diode or photodiode. For laser diodes with an internal monitor photodiode, the reverse voltage is specified for the laser diode as V_R (LD) and for the photodiode as V_R (PD).

Storage Temperature (T_{stg}) – Range of case temperatures within which the device may be safely stored.

Terms Describing Laser Diode Electro-optical Characteristics:

Commonly used abbreviations are shown in parentheses.

Automatic Power Control (APC) – Laser diode drive circuit based on a photodiode feedback loop that monitors the optical output and provides a control signal for the laser diode which maintains the operation at a constant optical output level. See additional information below on Drive Circuits and Operating in Constant Power Mode vs. Constant Current Mode.

Automatic Current Control (ACC) or Constant Current – Laser diode drive circuit that operates the laser diode without a photodiode feedback loop, the laser diode is simply driven at constant current. The optical output will fluctuate as the laser diode temperature changes. See additional information below on Drive Circuits and Operating in Constant Power Mode vs. Constant Current Mode.

Fall Time – Time required for the optical output to fall from 90% to 10% of its maximum value.

Mode Hopping – As the temperature of the laser chip increases, the operating wavelength also increases. Rather than a smooth, continuous transition in the operating wavelength, the wavelength makes discrete jumps to the longer wavelength modes. The phenomenon is referred to as “mode hopping” or “mode jumps”.

Monitor Current (I_m) – The current through the photodiode, at a specified reverse bias voltage, when the laser diode is producing its typical optical power output. Note: The manufacturers data may list specifications based on operation at lower optical output power than the devices absolute maximum rating. For example, the test condition might be 20mW for a diode with an absolute maximum optical output of 30mW.

Operating Current (I_{op}) – The amount of forward current through the laser diode necessary to produce the specified typical optical output at a specified operating temperature.

Operating Voltage (V_{op}) – The forward voltage across the laser diode when the device produces its specified typical optical output at a specified operating temperature.

Photodiode Dark Current (I_{D(PD)}) – The current through the reverse biased internal monitor photodiode when the laser diode is not emitting.

Optima® Laser Diode Application Notes and Glossary

Positional Accuracy (Dx, Dy, Dz) – Also referred to as emission point accuracy. These specifications define the positional accuracy of the laser diode emitter with respect to the device package. Delta x and delta y are measured as the planer displacement of the chip from the physical axis of the package. Delta z is measured perpendicular to the reference surface. Specifications may list both angular error expressed in degrees and the linear error in microns.

Rise Time – Time required for the optical output to rise from 10% to 90% of its maximum value.

Slope Efficiency (SE) or (η S) – Also referred to as differential efficiency. This is the mean value of the incremental change in optical power for an incremental change in forward current when the device is operating in the lasing region of the optical power output vs. forward current curve.

Threshold Current (I_{th}) – The boundary between spontaneous emission and the stimulated emission shown on the optical power output vs. forward current curve. Below the threshold current point, the output resembles the incoherent output from a LED; at or above the specified threshold current, the device begins to produce laser output. Once past the threshold point, stimulated emission is achieved and the optical output increases significantly for a small increase in forward current.

Wavelength (λ_p) – The wavelength of light emitted by the laser diode. For a single mode device, this is the wavelength of the single spectral line of the laser output. For a multi-mode device, this is the wavelength of the spectral line with the greatest intensity.

Terms Describing Laser Diode Optical Characteristics:

Commonly used abbreviations are shown in parentheses.

Aspect Ratio (AR) – The ratio of the laser diode's divergence angles, $\theta \perp$ (perpendicular) and $\theta //$ (parallel). A diode with a 27° perpendicular divergence and a 9° parallel divergence has an elliptical beam with an aspect ratio of 3:1.

Astigmatism (As) or (DAs) – The laser beam appears to have different source points for the directions perpendicular and parallel to the junction plane. The astigmatic distance is defined as the distance between the two apparent sources. A laser diode with a large amount of astigmatism must have the astigmatism corrected (or reduced) if the laser diode output is to be accurately focused – otherwise, the resulting focused beam will be astigmatic.

Beam Divergence ($\theta \perp$) and ($\theta //$) – Also referred to as radiation angles. The beam divergence is measured as the full angle and at the half-maximum intensity point, known as Full Width Half Maximum or FWHM. Angular specifications are provided for both the perpendicular axis and parallel axis.

Coupling Efficiency – The beam from the laser diode diverges as defined by the beam divergence specification. In coupling the laser diodes widely divergent beam into a lens or other device such as a fiber, the result is typically less than 100%. Coupling efficiency is defined as the percentage of total power output from the laser which effectively enters the external device (i.e. a lens or fiber).

Far Field Pattern (FFP) – Intensity profile of the beam when measured at a distance from the front facet of the laser diode chip.

Multimode Diodes – Laser diodes have either single or multiple longitudinal modes. For a multimode laser diode the emission spectrum consists of several individual spectral lines with a dominant line (line with the greatest intensity) occurring at the nominal wavelength of the device. Multimode laser diodes are often desirable as problems with mode hops are suppressed – consequently, multimode diodes generally have a better signal-to-noise ratio.

Near Field Pattern (NFP) – Intensity profile of the beam when measured at the front facet of the laser diode chip.

Numerical Aperture (NA) – The numerical aperture describes the ability of a lens to collect light from a source placed at its focal point. The maximum acceptance angle q , is measured from the center axis of the cone of light to the outside or surface of the cone.

Polarization Ratio – The output from a single cavity laser diode is linearly polarized parallel to the laser junction. Spontaneous emission with a random polarization and/or with a polarization perpendicular to the laser junction is also present. The polarization ratio is defined as the parallel component divided by the perpendicular component. For a diode operating near its maximum power the ratio is typically greater than 100:1. When operating near the threshold point, the ratio would be considerably lower as the spontaneous emission becomes more significant.

Optima® Laser Diode Application Notes and Glossary

Single-mode Diodes – Laser diodes have either single or multiple longitudinal modes. For a single-mode laser diode the emission spectrum consists of a single spectral line occurring at the nominal wavelength of the device. At output levels near threshold, multiple spectral lines may be present in the emission spectrum however, these secondary lines decrease as the output increases.

FAQ's and Laser Diode Basics:

There are a number of precautions listed in the laser diode manufacturer's catalogs that should be observed when working with laser diodes. Below are a few points that might be helpful if you're new to this field:

Safety Considerations – **The laser beam emitted by the laser diode is harmful if aimed directly into the human eye. Never look directly into the laser beam or at any specular reflections of the laser beam.**

Electro-Static Discharge – Laser diodes are extremely sensitive devices and visible laser diodes (VLD's) tend to be the most sensitive type. The handling precautions outlined by the laser diode manufacturers are not overstated – good work habits require personal grounding straps and grounded equipment. ESD does damage laser diodes!

Drive Circuits – Laser diodes should always be driven by either a Constant Current or Automatic Power Control (APC) circuit (the APC circuit may also be referred to as a Constant Power Mode circuit). For simplicity, an APC circuit is generally preferred, especially if the ambient temperature fluctuates. Typical circuits include slow-start or soft-start circuitry and provisions to ensure that spikes, surges, and other switching transients are eliminated. Regardless of type of circuit used, the drive current must not overshoot the maximum operating level - exceeding the maximum optical output for even a nanosecond will damage the mirror coatings on the laser diode end facets.

A standard laboratory power supply is not suitable for driving a laser diode.

Examples of the recommended drive circuits can be found in most manufacturer's laser diode data books. Unless you have prior experience with laser diodes and/or their drive circuits, this is not a place to reinvent the wheel - it can be very frustrating and expensive.

Operating in Constant Power Mode vs. Constant Current Mode – The characteristics of a laser diode are highly dependent on the temperature of the laser chip. For instance, the wavelength of a typical GaAlAs diode will increase on the order of 0.25nm for a 1°C rise in temperature. With a single mode diode, the change in wavelength may produce an undesirable effect known as "mode hops or mode-hopping".

Other characteristics directly related to laser diode's operating temperature are; threshold current, slope efficiency, wavelength, and lifetime. Perhaps the most important characteristic is the effect of temperature on the relationship between the diode's optical output and the injection current. In this case, the optical output decreases as the operating temperature increases or, conversely the optical output increases as the operating temperature decreases. Without limits and safeguards built into the laser drive circuit, a wide swing in operating temperature could be catastrophic. However, there are two techniques commonly used to achieve a stable optical output from a laser diode:

Constant Current mode combined with precise control of the diode's operating temperature is generally the preferred operating method. The constant current mode provides a faster control loop and a precision current reference for accurately monitoring the laser current. Further, in many cases the laser diode's internal photodiode may exhibit drift and have poor noise characteristics. If performance of the internal photodiode is inferior, the diode's optical output is likely to be noisy and unstable as well.

Constant Current operation without temperature control is generally not desirable – if the operating temperature of the laser diode decreases significantly, the optical power output will increase and could easily exceed the absolute maximum.

Constant Power or APC mode precludes the possibility of the optical power output increasing as the laser diode's temperature decreases. However, when operating in the constant power mode and without temperature control, mode hops and changes in wavelength will still occur. Further, if the diode's heat sink is inadequate and the temperature is allowed to increase, the optical power will decrease. In turn, the drive circuit will increase the injection current, attempting to maintain the optical power at a constant level. Without an absolute current limit thermal runaway is possible and the laser may be damaged and/or destroyed.

Summary – for stable operation and maximum laser lifetime – temperature control and constant current operation is generally the best solution. However, if precise temperature control of the laser diode is not practical, then an APC circuit should be used.

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Optima® Laser Diode Application Notes and Glossary

Drive Circuit Precautions – Even when a laser diode is driven by a suitable drive circuit, watch for possible intermittent or unreliable connections between the laser diode and the drive circuit. An intermittent contact in the photodiode feedback circuit will very likely destroy the laser diode. One not-so-obvious component to consider is the power control. If a potentiometer is used for setting the laser diode's power, evaluate the circuit design to determine the failure mode if the potentiometer's wiper breaks contact with the resistive element. Also, never use a switch or relay to make or break the connection between the drive circuit and the laser diode.

Power Measurements – The output from a laser diode must be measured with an optical power meter or a calibrated, large area photodiode. It's not practical or safe to estimate a laser diode's output power based on the diode manufacturers minimum-maximum data as each diode has unique operating characteristics and manufacturing tolerances.

Remember, once the laser diode is past the threshold point, stimulated emission is achieved and the optical output increases significantly for a small increase in forward current. Therefore, a very slight increase in drive current may cause the optical output to exceed the absolute maximum. Even with a visible diode, it's not feasible to judge the laser output by eye, an optical power meter or calibrated photodetector must be used.

Also, be sure to include optical losses through any lenses or other components when making measurements or calculations.

Operating Temperature and Heat Sinks – In most applications, laser diodes require heat sinks especially when operated continuously (CW). Without a heat sink the laser diode junction temperature will quickly increase causing the optical output to degrade. If the laser diode temperature continues to rise, exceeding the maximum operating temperature, the diode can be catastrophically damaged or the long term performance may degrade significantly. Generally, a lower operating temperature will help extend the diode's lifetime as the laser diode's reliability and MTTF are directly related to the junction temperature during operation. VLD's with lower wavelengths, i.e. ~635nm, appear to be more sensitive to temperature and users might consider thermoelectric cooling if operating in an environment with elevated ambient temperatures or if operational stability is a prerequisite. Also, using a small amount of a non-silicone type heat sink compound will improve thermal conductivity between the diode and heat sink.

Lifetime note: If the laser diode's operating temperature is reduced by about 10 degrees, the lifetime will statistically double.

Windows – Keep the laser diode window, and any other optics in the path, clean. Dust or fingerprints will cause diffraction or interference in the laser output that can result in lower output or anomalies in the far-field pattern. The window should be cleaned using a cotton swab and ethanol when necessary.

Cyanoacrylate Adhesive Precaution – "Super glue" should not be used anywhere near laser diodes - or near any other optical component - outgassing may fog windows and other optical surfaces. The amount of fogging, or the time required to observe the fogging, varies with different products. If you're in doubt, test the adhesive over time at an elevated temperature and in a sealed container. For example, place a drop of the adhesive in question on a piece of glass, something like a microscope slide, then place the sample in a plastic bag and seal the bag.

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Mitsubishi Laser Diode ML1016R Specifications



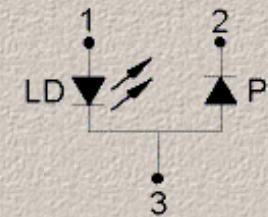
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658nm / 35mW / 5.6mm package

Absolute Maximum Ratings (Tc=25°C)

Characteristic	Symbol	Value	Unit
Optical output power	Po	35	mW
Pulse optical power output	Po (pulse)	50*	
Laser diode reverse voltage	VR(LD)	2	V
Photodiode reverse voltage	VR(PD)	30	V
Photodiode forward current	IF(PD)	10	mA
Operating temperature	Topr	-10 to +60	°C
Storage temperature	Tstg	-10 to +100	°C

Notes: * Pulse condition: Less than 50% duty cycle, less than 1μs pulse width.



ML1016R, 5.6mm Package
Internal Circuit & Pin Connections

Optical and Electrical Characteristics (Tc=25°C)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	Ith	-	45	70	mA	-
Operating current	Iop	-	85	120	mA	Po=30mW
Slope efficiency	η	-	0.8	-	mW/mA	Po=30mW
Laser diode operating voltage	Vop	-	2.7	3.2	V	Po=30mW
Lasing wavelength	λp	645	658	666	nm	Po=30mW
Beam divergence (parallel)	θ //	7	8.5	11	deg	Po=30mW (FWHM)

Beam divergence (perpendicular)	$\theta \perp$	17	22	26	deg	$P_o=30\text{mW}$ (FWHM)
Monitor current	I_m	0.05	0.3	2.5	mA	$P_o=30\text{mW}$, $V_{R(PD)}=1\text{V}$, $R_L=10\text{ ohm}$ (PD resistance load)
Photodiode dark current	$I_{D(PD)}$	-	-	0.5	$\mu\text{ A}$	$V_{R(PD)}=10\text{V}$
Photodiode capacitance	$C_{T(PD)}$	-	7	-	pF	$f=1\text{MHz}$, $V_{R(PD)}=5\text{V}$

Disclaimer: The laser diode information summarized above is based on the respective diode manufacturer's commercial catalog and/or data sheet specifications. The data is presumed to be accurate; however, it is subject to change without notice. Optima makes no representation as to the accuracy of the information and does not assume any responsibility for errors or omissions contained herein. The user must refer to the manufacturers specifications for details concerning the intended application and operation, diode limitations, and safety.

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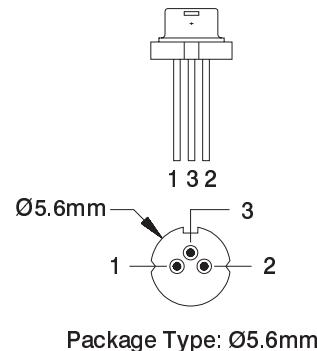
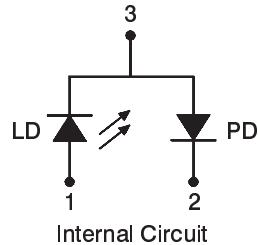
is is i L Laser Diode pe ifi a io s

The Mitsubishi L 0 6 is a high power Al_{0.5}Ga_{0.5}P laser diode which provides a stable, single transverse mode oscillation with a typical emission wavelength of 654 nm and the continuous light output of 30mW. The diode is suitable for large capacity optical disc memories, DVD-A drive, and similar optical systems. With a visible wavelength operating between 654nm and 666nm, the 30mW output is highly visible. The L 0 6 has a 5.6mm diameter package.

Absolute Maximum Ratings (Tc = 5°C)

Characteristic	Symbol	Value	Unit
Optical output power	P _o	35	mW
Pulse optical output power	P _o (pulse)	50 *	mW
Laser diode reverse voltage	V _R (LD)	2	V
Photodiode reverse voltage	V _R (PD)	30	V
Photodiode forward current	I _F (PD)	10	mA
Operating temperature	T _{opr}	-10 to +60	°C
Storage temperature	T _{stg}	-10 to +100	°C

Notes: * Pulse condition - Less than 50% duty cycle, less than 1 μs pulse width



Operating and Electrical Characteristics (Tc = 5°C)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	I _{th}	—	45	70	mA	—
Operating current	I _{op}	—	85	120	mA	P _o =30mW
Slope efficiency	η	—	0.8	—	mW/mA	P _o =30mW
Operating voltage	V _{op}	—	2.7	3.2	V	P _o =30mW
Lasing Wavelength	λ _p	645	658	666	nm	P _o =30mW
Beam divergence (parallel)	θ	7	8.5	11	deg	P _o =30mW, (FWHM)
Beam divergence (perpendicular)	θ _⊥	17	22	26	deg	P _o =30mW, (FWHM)
Monitor current	I _m	0.05	0.3	2.5	mA	P _o =30mW, V _R (PD)=1V RL=10V (PD resistance load)
Photodiode dark current	I _D (PD)	—	—	0.5	μA	V _R (PD)=10V
Photodiode capacitance	C _T (PD)	—	7	—	pF	f=1MHz, V _R (PD)=5V

Disclaimer: The laser diode information summarized above is based on the respective diode manufacturer's commercial catalog and/or data sheet specifications. The data is presumed to be accurate; however, it is subject to change without notice. Optima makes no representation as to the accuracy of the information and does not assume any responsibility for errors or omissions contained herein. The user must refer to the manufacturers specifications for details concerning the intended application and operation, diode limitations, and safety.

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Mitsubishi Laser Diode ML60125R Specifications



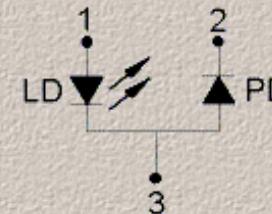
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785nm / 35mW / 5.6mm package

[Absolute Maximum Ratings \(Tc=25°C\)](#)

Characteristic	Symbol	Value	Unit
Optical output power	Po	35	mW
Pulse optical power output	Po (pulse)	50*	
Laser diode reverse voltage	VR(LD)	2	V
Photodiode reverse voltage	VR(PD)	30	V
Photodiode forward current	IF(PD)	10	mA
Operating temperature	Topr	-40 to +60	°C
Storage temperature	Tstg	-40 to +100	°C

Notes: * Pulse condition: Less than 50% duty cycle, less than 1μs pulse width.



ML60125R, 5.6mm Package
Internal Circuit & Pin Connections

[Optical and Electrical Characteristics \(Tc=25°C\)](#)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	Ith	-	35	50	mA	-
Operating current	Iop	-	85	110	mA	Po=30mW
Slope efficiency	η	-	0.6	-	mW/mA	Po=30mW
Laser diode operating voltage	Vop	-	2.0	2.5	V	Po=30mW
Lasing wavelength	λp	775	785	795	nm	Po=30mW

Mitsubishi ML60125R - Laser Diode Specifications

Beam divergence (parallel)	$\theta //$	9	10	11	deg	$P_o=30\text{mW}$ (FWHM)
Beam divergence (perpendicular)	$\theta \perp$	22	25	28	deg	$P_o=30\text{mW}$ (FWHM)
Monitor current	I_m	-	0.4	-	mA	$P_o=30\text{mW}$, $V_{R(PD)}=1\text{V}$, $R_L=10\text{ ohm}$ (PD resistance load)
Photodiode dark current	$I_{D(PD)}$	-	-	0.5	$\mu\text{ A}$	$V_{R(PD)}=10\text{V}$
Photodiode capacitance	$C_{T(PD)}$	-	7	-	pF	$f=1\text{MHz}$, $V_{R(PD)}=5\text{V}$

Disclaimer: The laser diode information summarized above is based on the respective diode manufacturer's commercial catalog and/or data sheet specifications. The data is presumed to be accurate; however, it is subject to change without notice. Optima makes no representation as to the accuracy of the information and does not assume any responsibility for errors or omissions contained herein. The user must refer to the manufacturers specifications for details concerning the intended application and operation, diode limitations, and safety.

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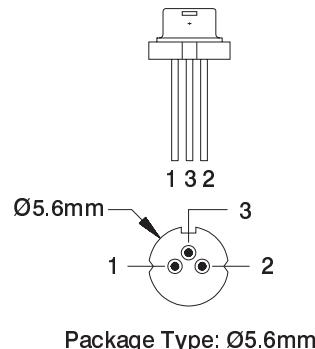
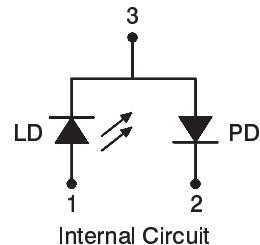
Laser Diode pe ifi a io s

The Mitsubishi L60 5 is a high power Al_xAs laser diode which provides a stable, single transverse mode oscillation with a typical emission wavelength of 5nm and the continuous light output of 30mW. The device is produced by the CVD crystal growth method which has excellent uniformity in mass production. The L60 5 has a multi quantum well (MQW) active layer and is a high-performance, long life semiconductor laser. The L60 5 has a 5.6mm diameter package.

Absolute Maximum Ratings (Tc = 5°C)

Characteristic	Symbol	Value	Unit
Optical output power	P _o	35	mW
Pulse optical output power	P _o (pulse)	50 *	mW
Laser diode reverse voltage	V _R (LD)	2	V
Photodiode reverse voltage	V _R (PD)	30	V
Photodiode forward current	I _F (PD)	10	mA
Operating temperature	T _{opr}	-40 to +60	°C
Storage temperature	T _{stg}	-40 to +100	°C

Notes: * Pulse condition - Less than 50% duty cycle, less than 1 μs pulse width



Operating and Electrical Characteristics (Tc = 5°C)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	I _{th}	—	35	50	mA	—
Operating current	I _{op}	—	85	110	mA	Po=30mW
Slope efficiency	η	—	0.6	—	mW/mA	Po=30mW
Operating voltage	V _{op}	—	2.0	2.5	V	Po=30mW
Lasing Wavelength	λ _p	775	785	795	nm	Po=30mW
Beam divergence (parallel)	θ	9	10	11	deg	Po=30mW, (FWHM)
Beam divergence (perpendicular)	θ _⊥	22	25	28	deg	Po=30mW, (FWHM)
Monitor current	I _m	—	0.4	—	mA	Po=30mW, VR(PD)=1V RL=10V (PD resistance load)
Photodiode dark current	I _D (PD)	—	—	0.5	μA	VR(PD)=10V
Photodiode capacitance	C _T (PD)	—	7	—	pF	f=1MHz, VR(PD)=5V

Disclaimer: The laser diode information summarized above is based on the respective diode manufacturer's commercial catalog and/or data sheet specifications. The data is presumed to be accurate; however, it is subject to change without notice. Optima makes no representation as to the accuracy of the information and does not assume any responsibility for errors or omissions contained herein. The user must refer to the manufacturers specifications for details concerning the intended application and operation, diode limitations, and safety.

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Mitsubishi Laser Diode ML64114R Specifications



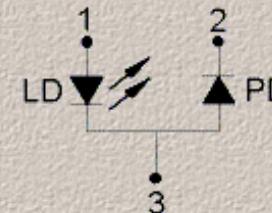
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785nm / 60mW / 9mm package

Absolute Maximum Ratings (Tc=25°C)

Characteristic	Symbol	Value	Unit
Optical output power	Po	60	mW
Pulse optical power output	Po (pulse)	70*	
Laser diode reverse voltage	VR(LD)	2	V
Photodiode reverse voltage	VR(PD)	30	V
Photodiode forward current	IF(PD)	10	mA
Operating temperature	Topr	-40 to +60	°C
Storage temperature	Tstg	-55 to +100	°C

Notes: * Pulse condition: Less than 50% duty cycle, less than 1μs pulse width.



ML64114R, 9mm Package
Internal Circuit & Pin Connections

Optical and Electrical Characteristics (Tc=25°C)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	Ith	-	55	80	mA	-
Operating current	Iop	-	140	165	mA	Po=50mW
Slope efficiency	η	0.40	0.55	0.75	mW/mA	Po=50mW
Laser diode operating voltage	Vop	-	2.0	2.5	V	Po=50mW
Lasing wavelength	λp	770	785	800	nm	Po=50mW

Beam divergence (parallel)	$\theta //$	8	10	13	deg	Po=50mW (FWHM)
Beam divergence (perpendicular)	$\theta \perp$	22	25	28	deg	Po=50mW (FWHM)
Monitor current	Im	-	0.4	-	mA	Po=50mW, VR(PD)=1V, RL=10 ohm (PD resistance load)
Photodiode dark current	ID(PD)	-	-	0.5	μ A	VR(PD)=10V
Photodiode capacitance	CT(PD)	-	7	-	pF	f=1MHz, VR(PD)=5V

Disclaimer: The laser diode information summarized above is based on the respective diode manufacturer's commercial catalog and/or data sheet specifications. The data is presumed to be accurate; however, it is subject to change without notice. Optima makes no representation as to the accuracy of the information and does not assume any responsibility for errors or omissions contained herein. The user must refer to the manufacturers specifications for details concerning the intended application and operation, diode limitations, and safety.

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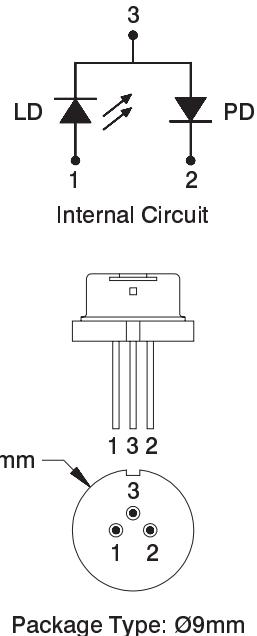
is is i L Laser Diode pe ifi a io s

The Mitsubishi L6 is a high power AlGaAs laser diode which provides a stable, single transverse mode oscillation with a typical emission wavelength of 5nm and the continuous light output of 50mW. The device is produced by the CVD crystal growth method which has excellent uniformity in mass production. The L6 has a multi quantum well (MQW) active layer and is a high-performance, long life semiconductor laser. The L6 has a 9mm diameter package.

Absolute Maximum Ratings (Tc = 5°C)

Characteristic	Symbol	Value	Unit
Optical output power	Po	60	mW
Pulse optical output power	Po (pulse)	70 *	mW
Laser diode reverse voltage	VR(LD)	2	V
Photodiode reverse voltage	VR(PD)	30	V
Photodiode forward current	IF(PD)	10	mA
Operating temperature	Topr	-40 to +60	°C
Storage temperature	Tstg	-55 to +100	°C

Notes: * Pulse condition - Less than 50% duty cycle, less than 1 μs pulse width



Operating and Electrical Characteristics (Tc = 5°C)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	Ith	—	55	80	mA	—
Operating current	Iop	—	140	165	mA	Po=50mW
Slope efficiency	η	0.40	0.55	0.75	mW/mA	Po=50mW
Operating voltage	Vop	—	2.0	2.5	V	Po=50mW
Lasing Wavelength	λp	770	785	800	nm	Po=50mW
Beam divergence (parallel)	θ//	8	10	13	deg	Po=50mW, (FWHM)
Beam divergence (perpendicular)	θ⊥	22	25	28	deg	Po=50mW, (FWHM)
Monitor current	Im	—	0.4	—	mA	Po=50mW, VR(PD)=1V RL=10V (PD resistance load)
Photodiode dark current	ID(PD)	—	—	0.5	μA	VR(PD)=10V
Photodiode capacitance	CT(PD)	—	7	—	pF	f=1MHz, VR(PD)=5V

Disclaimer: The laser diode information summarized above is based on the respective diode manufacturer's commercial catalog and/or data sheet specifications. The data is presumed to be accurate; however, it is subject to change without notice. Optima makes no representation as to the accuracy of the information and does not assume any responsibility for errors or omissions contained herein. The user must refer to the manufacturers specifications for details concerning the intended application and operation, diode limitations, and safety.

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Mitsubishi Laser Diode ML60116R Specifications



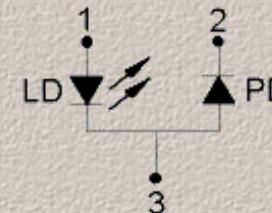
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785nm / 40mW / 5.6mm package

Absolute Maximum Ratings (Tc=25°C)

Characteristic	Symbol	Value	Unit
Optical output power	Po	40	mW
Pulse optical power output	Po (pulse)	50*	
Laser diode reverse voltage	VR(LD)	2	V
Photodiode reverse voltage	VR(PD)	30	V
Photodiode forward current	IF(PD)	10	mA
Operating temperature	Topr	-40 to +60	°C
Storage temperature	Tstg	-55 to +100	°C

Notes: * Pulse condition: Less than 50% duty cycle, less than 1μs pulse width.



ML60116R, 5.6mm Package
Internal Circuit & Pin Connections

Optical and Electrical Characteristics (Tc=25°C)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	Ith	-	30	50	mA	-
Operating current	Iop	-	80	110	mA	Po=30mW
Slope efficiency	η	0.40	0.55	0.75	mW/mA	Po=30mW
Laser diode operating voltage	Vop	-	2.0	2.5	V	Po=30mW
Lasing wavelength	λp	770	785	800	nm	Po=30mW

Beam divergence (parallel)	$\theta //$	8	10	13	deg	Po=30mW (FWHM)
Beam divergence (perpendicular)	$\theta \perp$	22	25	28	deg	Po=30mW (FWHM)
Monitor current	Im	-	0.2	-	mA	Po=30mW, VR(PD)=1V, RL=10 ohm (PD resistance load)
Photodiode dark current	ID(PD)	-	-	0.5	μ A	VR(PD)=10V
Photodiode capacitance	CT(PD)	-	7	-	pF	f=1MHz, VR(PD)=5V

Disclaimer: The laser diode information summarized above is based on the respective diode manufacturer's commercial catalog and/or data sheet specifications. The data is presumed to be accurate; however, it is subject to change without notice. Optima makes no representation as to the accuracy of the information and does not assume any responsibility for errors or omissions contained herein. The user must refer to the manufacturers specifications for details concerning the intended application and operation, diode limitations, and safety.

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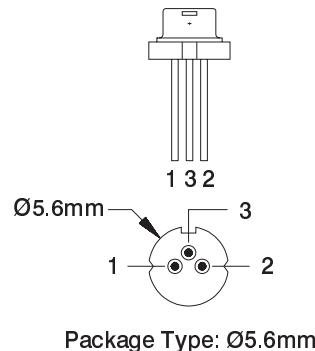
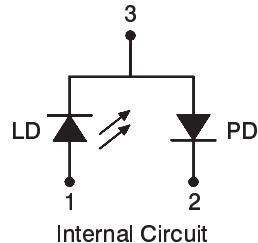
is is i L Laser Diode pe ifi a io s

The Mitsubishi L60-6 is a high power Al_{0.3}Ga_{0.7}As laser diode which provides a stable, single transverse mode oscillation with a typical emission wavelength of 532nm and the continuous light output of 30mW. The device is produced by the CVD crystal growth method which has excellent uniformity in mass production. The L60-6 has a multi quantum well (MQW) active layer and is a high-performance, long life semiconductor laser. The L60-6 has a 5.6mm diameter package.

Absolute Maximum Ratings (Tc = 5°C)

Characteristic	Symbol	Value	Unit
Optical output power	P _o	40	mW
Pulse optical output power	P _o (pulse)	50 *	mW
Laser diode reverse voltage	V _R (LD)	2	V
Photodiode reverse voltage	V _R (PD)	30	V
Photodiode forward current	I _F (PD)	10	mA
Operating temperature	T _{opr}	-40 to +60	°C
Storage temperature	T _{stg}	-55 to +100	°C

Notes: * Pulse condition - Less than 50% duty cycle, less than 1 μs pulse width



Operating and Electrical Characteristics (Tc = 5°C)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	I _{th}	—	30	50	mA	—
Operating current	I _{op}	—	80	110	mA	Po=30mW
Slope efficiency	η	0.40	0.55	0.75	mW/mA	Po=30mW
Operating voltage	V _{op}	—	2.0	2.5	V	Po=30mW
Lasing Wavelength	λ _p	770	785	800	nm	Po=30mW
Beam divergence (parallel)	θ	8	10	13	deg	Po=30mW, (FWHM)
Beam divergence (perpendicular)	θ _⊥	22	25	28	deg	Po=30mW, (FWHM)
Monitor current	I _m	—	0.2	—	mA	Po=30mW, VR(PD)=1V RL=10V (PD resistance load)
Photodiode dark current	I _D (PD)	—	—	0.5	μA	VR(PD)=10V
Photodiode capacitance	C _T (PD)	—	7	—	pF	f=1MHz, VR(PD)=5V

Disclaimer: The laser diode information summarized above is based on the respective diode manufacturer's commercial catalog and/or data sheet specifications. The data is presumed to be accurate; however, it is subject to change without notice. Optima makes no representation as to the accuracy of the information and does not assume any responsibility for errors or omissions contained herein. The user must refer to the manufacturers specifications for details concerning the intended application and operation, diode limitations, and safety.

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Mitsubishi Laser Diode ML60114R Specifications



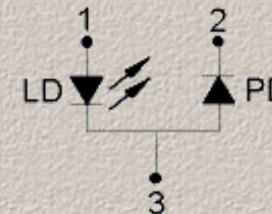
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785nm / 60mW / 5.6mm package

[Absolute Maximum Ratings \(Tc=25°C\)](#)

Characteristic	Symbol	Value	Unit
Optical output power	Po	60	mW
Pulse optical power output	Po (pulse)	70*	
Laser diode reverse voltage	VR(LD)	2	V
Photodiode reverse voltage	VR(PD)	30	V
Photodiode forward current	IF(PD)	10	mA
Operating temperature	Topr	-40 to +60	°C
Storage temperature	Tstg	-55 to +100	°C

Notes: * Pulse condition: Less than 50% duty cycle, less than 1μs pulse width.



ML60114R, 5.6mm Package
Internal Circuit & Pin Connections

[Optical and Electrical Characteristics \(Tc=25°C\)](#)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	Ith	-	55	80	mA	-
Operating current	Iop	-	140	165	mA	Po=50mW
Slope efficiency	η	0.40	0.55	0.75	mW/mA	Po=50mW
Laser diode operating voltage	Vop	-	2.0	2.5	V	Po=50mW
Lasing wavelength	λp	770	785	800	nm	Po=50mW

Beam divergence (parallel)	$\theta //$	8	10	13	deg	Po=50mW (FWHM)
Beam divergence (perpendicular)	$\theta \perp$	22	25	28	deg	Po=50mW (FWHM)
Monitor current	Im	-	0.4	-	mA	Po=50mW, VR(PD)=1V, RL=10 ohm (PD resistance load)
Photodiode dark current	ID(PD)	-	-	0.5	μ A	VR(PD)=10V
Photodiode capacitance	CT(PD)	-	7	-	pF	f=1MHz, VR(PD)=5V

Disclaimer: The laser diode information summarized above is based on the respective diode manufacturer's commercial catalog and/or data sheet specifications. The data is presumed to be accurate; however, it is subject to change without notice. Optima makes no representation as to the accuracy of the information and does not assume any responsibility for errors or omissions contained herein. The user must refer to the manufacturers specifications for details concerning the intended application and operation, diode limitations, and safety.

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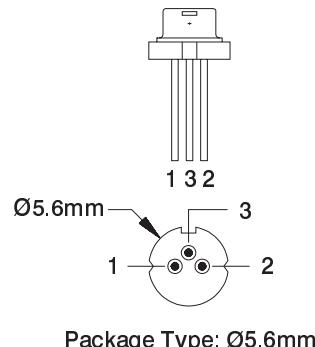
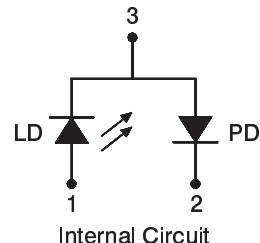
is is i L Laser Diode pe ifi a io s

The Mitsubishi L60 is a high power Al_xAs laser diode which provides a stable, single transverse mode oscillation with a typical emission wavelength of 5nm and the continuous light output of 50mW. The device is produced by the CVD crystal growth method which has excellent uniformity in mass production. The L60 has a multi quantum well (MQW) active layer and is a high-performance, long life semiconductor laser. The L60 has a 5.6mm diameter package.

Absolute Maximum Ratings (Tc = 5°C)

Characteristic	Symbol	Value	Unit
Optical output power	P _o	60	mW
Pulse optical output power	P _o (pulse)	70 *	mW
Laser diode reverse voltage	V _R (LD)	2	V
Photodiode reverse voltage	V _R (PD)	30	V
Photodiode forward current	I _F (PD)	10	mA
Operating temperature	T _{opr}	-40 to +60	°C
Storage temperature	T _{stg}	-55 to +100	°C

Notes: * Pulse condition - Less than 50% duty cycle, less than 1 μs pulse width



Operating and Electrical Characteristics (Tc = 5°C)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	I _{th}	—	55	80	mA	—
Operating current	I _{op}	—	140	165	mA	P _o =50mW
Slope efficiency	η	0.40	0.55	0.75	mW/mA	P _o =50mW
Operating voltage	V _{op}	—	2.0	2.5	V	P _o =50mW
Lasing Wavelength	λ _p	770	785	800	nm	P _o =50mW
Beam divergence (parallel)	θ	8	10	13	deg	P _o =50mW, (FWHM)
Beam divergence (perpendicular)	θ _⊥	22	25	28	deg	P _o =50mW, (FWHM)
Monitor current	I _m	—	0.4	—	mA	P _o =50mW, V _R (PD)=1V RL=10V (PD resistance load)
Photodiode dark current	I _D (PD)	—	—	0.5	μA	V _R (PD)=10V
Photodiode capacitance	C _T (PD)	—	7	—	pF	f=1MHz, V _R (PD)=5V

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Laser Diode Specifications - Sanyo DL3148-011



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635nm / 5mW / 5.6mm package

Absolute Maximum Ratings (Tc=25°C)

Characteristic	Symbol	Value	Unit
Optical output power	Po	5	mW
Laser diode reverse voltage	V _{R(LD)}	2	V
Photodiode reverse voltage	V _{R(PD)}	30	V
Operating temperature	T _{opr}	-10 to +40	°C
Storage temperature	T _{stg}	-40 to +85	°C

DL3148-011 5.6mm Package
Internal Circuit & Pin Connections

Optical and Electrical Characteristics (Tc=25°C)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	I _{th}	-	40	60	mA	-
Operating current	I _{op}	-	55	75	mA	Po=5mW
Laser diode operating voltage	V _{op}	-	2.2	2.4	V	Po=5mW
Lasing wavelength	λ _p	-	635	640	nm	Po=5mW
Beam divergence (parallel)	θ //	6	8	10	deg	Po=5mW (FWHM)
Beam divergence (perpendicular)	θ ⊥	25	30	35	deg	Po=5mW (FWHM)
Differential efficiency	η	0.1	0.3	-	mW/mA	-
Monitor current	I _m	0.05	0.15	0.6	mA	Po=5mW
Astigmatism	A _s	-	8	-	microns	Po=5mW

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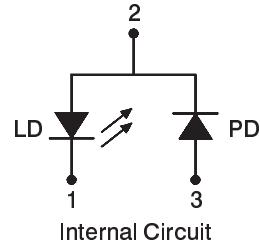
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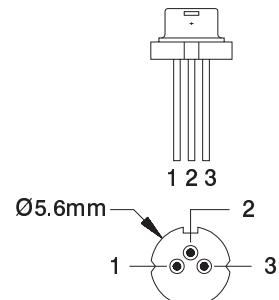
ao DL Laser Diode pe ifi a io s

The ayo DL3 -0 has a typical output of 635nm. The diode features low threshold current and is mainly intended for applications li e laser pointers. The DL3 -0 has a Ø5.6mm pac age.



bsolute Ma imum atin s (Tc 5)

Characteristic	Symbol	Value	Unit
Optical output power	Po	5	mW
Laser diode reverse voltage	VR(LD)	2	V
Photodiode reverse voltage	VR(PD)	30	V
Operating temperature	Topr	– 10 to + 40	°C
Storage temperature	Tstg	– 40 to + 85	°C



Package Type: Ø5.6mm

Operatin and lectrical haracteristics (Tc 5)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	Ith	–	40	60	mA	–
Operating current	Iop	–	55	75	mA	Po=5mW
Operating voltage	Vop	–	2.2	2.4	V	Po=5mW
Lasing Wavelength	λp	–	635	640	nm	Po=5mW
Beam divergence (parallel)	θ//	6	8	10	deg	Po=5mW, (FWHM)
Beam divergence (perpendicular)	θ⊥	25	30	35	deg	Po=5mW, (FWHM)
Differential efficiency	η	0.1	0.3	–	mW/mA	–
Monitor current	Im	0.05	0.15	0.6	mA	Po=5mW
Astigmatism	As	–	8	–	microns	Po=5mW

Disclaimer: The laser diode information summarized above is based on the respective diode manufacturer's commercial catalog and/or data sheet specifications. The data is presumed to be accurate; however, it is subject to change without notice. Optima makes no representation as to the accuracy of the information and does not assume any responsibility for errors or omissions contained herein. The user must refer to the manufacturers specifications for details concerning the intended application and operation, diode limitations, and safety.

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Laser Diode Specifications - Sanyo DL3038-033

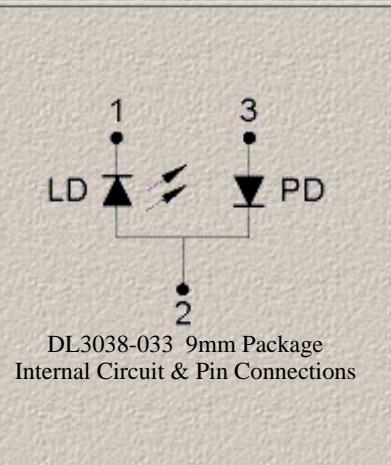


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635nm / 5mW / 9mm package

Absolute Maximum Ratings (Tc=25°C)

Characteristic	Symbol	Value	Unit
Optical output power	Po	5	mW
Laser diode reverse voltage	V _{R(LD)}	2	V
Photodiode reverse voltage	V _{R(PD)}	30	V
Operating temperature	T _{opr}	-10 to +50	°C
Storage temperature	T _{stg}	-40 to +85	°C



Optical and Electrical Characteristics (Tc=25°C)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	I _{th}	-	30	50	mA	-
Operating current	I _{op}	-	40	60	mA	Po=5mW
Laser diode operating voltage	V _{op}	-	2.2	2.4	V	Po=5mW
Lasing wavelength	λ _p	-	635	640	nm	Po=5mW
Beam divergence (parallel)	θ //	6	8	10	deg	Po=5mW (FWHM)
Beam divergence (perpendicular)	θ ⊥	25	35	40	deg	Po=5mW (FWHM)
Differential efficiency	η	-	0.4	-	mW/mA	-
Monitor current	I _m	0.15	0.3	0.65	mA	Po=5mW
Astigmatism	A _s	-	8	-	microns	Po=5mW

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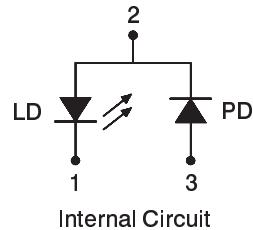
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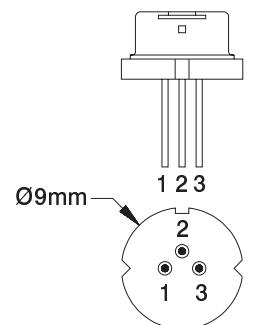
a o DL Laser Diode pe ifi a io s

The anyo DL303-03 is an index guided AlGaAs laser diode with a typical output of 635nm. The diode features low threshold current and short wavelength which is achieved by a strained multi-quantum well active layer. The lasing wavelength of 635nm is eight times brighter than a 630nm diode. The DL303-03 is suitable for applications including bar-code readers, laser pointers, and laser levels. The DL303-03 has a Ø9mm package.



Absolute Maximum Ratings (Tc = 5°C)

Characteristic	Symbol	Value	Unit
Optical output power	Po	5	mW
Laser diode reverse voltage	VR(LD)	2	V
Photodiode reverse voltage	VR(PD)	30	V
Operating temperature	Topr	–10 to +50	°C
Storage temperature	Tstg	–40 to +85	°C



Package Type: Ø9mm

Operating and Electrical Characteristics (Tc = 5°C)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	Ith	–	30	50	mA	–
Operating current	Iop	–	40	60	mA	Po=5mW
Operating voltage	Vop	–	2.2	2.4	V	Po=5mW
Lasing Wavelength	λp	–	635	640	nm	Po=5mW
Beam divergence (parallel)	θ//	6	8	10	deg	Po=5mW, (FWHM)
Beam divergence (perpendicular)	θ⊥	25	35	40	deg	Po=5mW, (FWHM)
Differential efficiency	η	–	0.4	–	mW/mA	–
Monitor current	Im	0.15	0.3	0.65	mA	Po=5mW
Astigmatism	As	–	8	–	microns	Po=5mW

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Laser Diode Specifications - Sanyo DL3147-011



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645nm / 5mW / 5.6mm package

Absolute Maximum Ratings (Tc=25°C)

Characteristic	Symbol	Value	Unit
Optical output power	Po	5	mW
Laser diode reverse voltage	V _{R(LD)}	2	V
Photodiode reverse voltage	V _{R(PD)}	30	V
Operating temperature	T _{opr}	-10 to +40	°C
Storage temperature	T _{stg}	-20 to +85	°C

DL3147-011 5.6mm Package
Internal Circuit & Pin Connections

Optical and Electrical Characteristics (Tc=25°C)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	I _{th}	-	30	50	mA	-
Operating current	I _{op}	-	40	60	mA	Po=5mW
Operating voltage	V _{op}	-	2.3	2.6	V	Po=5mW
Lasing wavelength	λ _p	-	645	660	nm	Po=5mW
Beam divergence (parallel)	θ //	6	7.5	10	deg	Po=5mW (FWHM)
Beam divergence (perpendicular)	θ ⊥	25	30	40	deg	Po=5mW (FWHM)
Differential efficiency	η	-	0.40	-	mW/mA	-
Monitor current	I _m	0.07	0.2	0.45	mA	Po=5mW

Disclaimer: The laser diode information summarized above is based on the respective diode manufacturer's commercial catalog and/or data sheet specifications. The data is presumed to be accurate; however, it is subject to change without notice. Optima makes no representation as to the accuracy of the information and does not assume any responsibility for errors or omissions contained herein. The user must refer to the manufacturers specifications for details concerning the intended application and operation, diode limitations, and safety.

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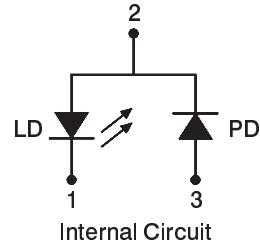
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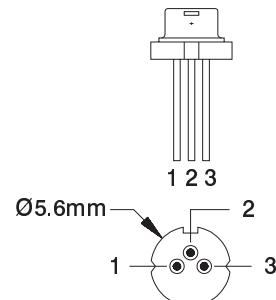
a o DL Laser Diode pe ifi a io s

The anyo DL3 -0 is an inde guided Aa nPlaser diode with a typical output of 6.5nm. The diode features low threshold current and is mainly intended for applications li e laser pointers. The DL3 -0 has a Ø5.6mm pac age.



Absolute Maximum Ratings (Tc = 5 °C)

Characteristic	Symbol	Value	Unit
Optical output power	Po	5	mW
Laser diode reverse voltage	VR(LD)	2	V
Photodiode reverse voltage	VR(PD)	30	V
Operating temperature	Topr	–10 to +40	°C
Storage temperature	Tstg	–20 to +85	°C



Operatin and lectrical haracteristics (Tc = 5 °C)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	Ith	–	30	50	mA	–
Operating current	Iop	–	40	60	mA	Po=5mW
Operating voltage	Vop	–	2.3	2.6	V	Po=5mW
Lasing wavelength	λp	–	645	660	nm	Po=5mW
Beam divergence (parallel)	θ//	6	7.5	10	deg	Po=5mW, (FWHM)
Beam divergence (perpendicular)	θ⊥	25	30	40	deg	Po=5mW, (FWHM)
Differential efficiency	η	–	0.4	–	mW/mA	–
Monitor current	Im	0.07	0.2	0.45	mA	Po=5mW

Disclaimer: The laser diode information summarized above is based on the respective diode manufacturer's commercial catalog and/or data sheet specifications. The data is presumed to be accurate; however, it is subject to change without notice. Optima makes no representation as to the accuracy of the information and does not assume any responsibility for errors or omissions contained herein. The user must refer to the manufacturers specifications for details concerning the intended application and operation, diode limitations, and safety.

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Laser Diode Specifications - Sanyo DL4038-025

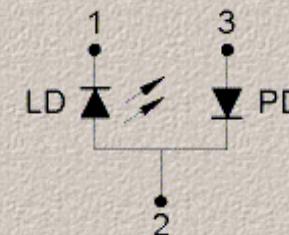


[DL403825.PDF](#) (83K) Click on the file name to download an Adobe PDF file covering this page.

635nm / 20mW / 9mm package

Absolute Maximum Ratings (Tc=25°C)

Characteristic	Symbol	Value	Unit
Optical output power	Po	20	mW
Laser diode reverse voltage	V _{R(LD)}	2	V
Photodiode reverse voltage	V _{R(PD)}	30	V
Operating temperature	T _{opr}	-10 to +40	°C
Storage temperature	T _{stg}	-40 to +85	°C



DL4038-025 9mm Package
Internal Circuit & Pin Connections

Optical and Electrical Characteristics (Tc=25°C)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	I _{th}	-	45	70	mA	-
Operating current	I _{op}	-	80	110	mA	Po=20mW
Laser diode operating voltage	V _{op}	-	2.3	2.5	V	Po=20mW
Lasing wavelength	λ _p	-	635	645	nm	Po=20mW
Beam divergence (parallel)	θ //	6	7	10	deg	Po=20mW (FWHM)
Beam divergence (perpendicular)	θ ⊥	20	25	35	deg	Po=20mW (FWHM)
Differential efficiency	η	-	0.6	-	mW/mA	-
Monitor current	I _m	-	0.03	-	mA	Po=20mW
Astigmatism	A _s	-	10	-	microns	Po=20mW

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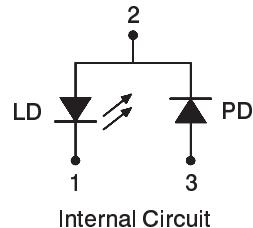
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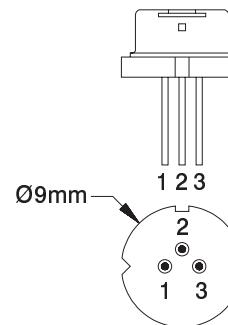
Laser Diode pe ifi a io s

The anyo DL 03-0 5 is an inde guided Aa nPlaser diode with a typical output of 635nm and an absolute ma imum output of 0m . The diode features low threshold current which is achieved by a strained multi-quantum well active layer. A lasing wavelength of 635nm is eight times brighter than a 6 0nm diode. The DL 03-0 5 is suitable for applications including laser printers, laser alignment systems, and laser levels. The DL 03-0 5 has a Ø9mm pac age.



Absolute Maximum Ratings (Tc = 5 °C)

Characteristic	Symbol	Value	Unit
Optical output power	Po	20	mW
Laser diode reverse voltage	VR(LD)	2	V
Photodiode reverse voltage	VR(PD)	30	V
Operating temperature	Topr	– 10 to + 40	°C
Storage temperature	Tstg	– 40 to + 85	°C



Package Type: Ø9mm

Operating and Electrical Characteristics (Tc = 5 °C)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	Ith	–	45	70	mA	–
Operating current	Iop	–	80	110	mA	Po=20mW
Operating voltage	Vop	–	2.3	2.5	V	Po=20mW
Lasing Wavelength	λp	–	635	645	nm	Po=20mW
Beam divergence (parallel)	θ//	6	7	10	deg	Po=20mW, (FWHM)
Beam divergence (perpendicular)	θ⊥	20	25	35	deg	Po=20mW, (FWHM)
Differential efficiency	η	–	0.6	–	mW/mA	–
Monitor current	Im	–	0.03	–	mA	Po=20mW
Astigmatism	As	–	10	–	microns	Po=20mW

Disclaimer: The laser diode information summarized above is based on the respective diode manufacturer's commercial catalog and/or data sheet specifications. The data is presumed to be accurate; however, it is subject to change without notice. Optima makes no representation as to the accuracy of the information and does not assume any responsibility for errors or omissions contained herein. The user must refer to the manufacturers specifications for details concerning the intended application and operation, diode limitations, and safety.

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Laser Diode Specifications - Sanyo DL3147-041



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645nm / 5mW / 5.6mm package

Absolute Maximum Ratings (Tc=25°C)

Characteristic	Symbol	Value	Unit
Optical output power	Po	5	mW
Laser diode reverse voltage	V _{R(LD)}	2	V
Photodiode reverse voltage	V _{R(PD)}	30	V
Operating temperature	T _{opr}	-10 to +60	°C
Storage temperature	T _{stg}	-40 to +85	°C

DL3147-041 5.6mm Package
Internal Circuit & Pin Connections

Optical and Electrical Characteristics (Tc=25°C)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	I _{th}	25	45	60	mA	-
Operating current	I _{op}	40	60	80	mA	Po=5mW
Operating voltage	V _{op}	2.0	2.2	2.5	V	Po=5mW
Lasing wavelength	λ _p	635	645	655	nm	Po=5mW
Beam divergence (parallel)	θ //	7	7.5	10	deg	Po=5mW (FWHM)
Beam divergence (perpendicular)	θ ⊥	25	30	40	deg	Po=5mW (FWHM)
Differential efficiency	η	0.15	0.35	0.8	mW/mA	-
Monitor current	I _m	0.05	0.15	0.5	mA	Po=5mW
Astigmatism	A _s	-	8	-	microns	Po=5mW

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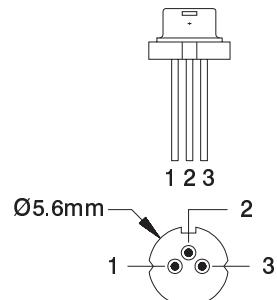
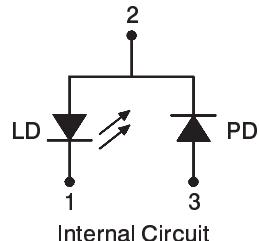
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ano DL Laser Diode pe ifi a io s

The anyo DL3 -0 is an inde guided Aa nPlaser diode with a typical output of 6.5nm. The diode features low threshold current and an e tended operating temperature which is achieved by a strained multi-quantum well active layer. The DL3 -0 is suitable for applications including bar-code readers, optical disc systems and similar optical storage products. The DL3 -0 has a Ø5.6mm pac age.

bsolute Ma imum atin s (Tc 5)

Characteristic	Symbol	Value	Unit
Optical output power	Po	5	mW
Laser diode reverse voltage	VR(LD)	2	V
Photodiode reverse voltage	VR(PD)	30	V
Operating temperature	Topr	– 10 to + 60	°C
Storage temperature	Tstg	– 40 to + 85	°C



Package Type: Ø5.6mm

Operatin and lectrical haracteristics (Tc 5)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	Ith	25	45	60	mA	–
Operating current	Iop	40	60	80	mA	Po=5mW
Operating voltage	Vop	2.0	2.2	2.5	V	Po=5mW
Lasing Wavelength	λp	635	645	655	nm	Po=5mW
Beam divergence (parallel)	θ//	7	7.5	10	deg	Po=5mW, (FWHM)
Beam divergence (perpendicular)	θ⊥	25	30	40	deg	Po=5mW, (FWHM)
Differential efficiency	η	0.15	0.35	0.8	mW/mA	–
Monitor current	Im	0.05	0.15	0.5	mA	Po=5mW
Astigmatism	As	–	8	–	microns	Po=5mW

Disclaimer: The laser diode information summarized above is based on the respective diode manufacturer's commercial catalog and/or data sheet specifications. The data is presumed to be accurate; however, it is subject to change without notice. Optima makes no representation as to the accuracy of the information and does not assume any responsibility for errors or omissions contained herein. The user must refer to the manufacturers specifications for details concerning the intended application and operation, diode limitations, and safety.

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Laser Diode Specifications - Sanyo DL3149-054



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670nm / 5mW / 5.6mm package

Absolute Maximum Ratings (Tc=25°C)

Characteristic	Symbol	Value	Unit
Optical output power	Po	5	mW
Laser diode reverse voltage	V _{R(LD)}	2	V
Photodiode reverse voltage	V _{R(PD)}	30	V
Operating temperature	T _{opr}	-10 to +60	°C
Storage temperature	T _{stg}	-40 to +85	°C

DL3149-054 5.6mm Package
Internal Circuit & Pin Connections

Optical and Electrical Characteristics (Tc=25°C)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	I _{th}	-	30	50	mA	-
Operating current	I _{op}	-	45	60	mA	Po=5mW
Lasing wavelength	λ _p	660	670	680	nm	Po=5mW
Beam divergence (parallel)	θ //	6	8	10	deg	Po=5mW (FWHM)
Beam divergence (perpendicular)	θ ⊥	25	33	40	deg	Po=5mW (FWHM)
Differential efficiency	η	0.15	0.3	-	mW/mA	-
Monitor current	I _m	0.4	1.2	2.0	mA	Po=5mW
Astigmatism	A _s	-	8	-	microns	Po=5mW

Disclaimer: The laser diode information summarized above is based on the respective diode manufacturer's commercial catalog and/or data sheet specifications. The data is presumed to be accurate; however, it is subject to change without notice. Optima makes no representation as to the accuracy of the information and does not assume any responsibility for errors or omissions contained herein. The user must refer to the manufacturers specifications for details concerning the intended application and operation, diode limitations, and safety.

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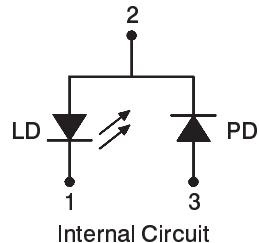
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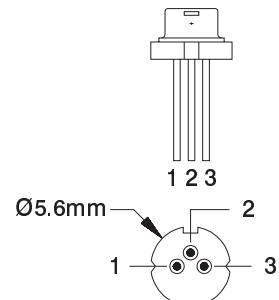
a o DL Laser Diode pe ifi a io s

The anyo DL3 9-05 is an inde guided Aa nPlaser diode with a typical output of 6 0nm. The diode features low threshold current and an e tended operating temperature which is achieved by a strained multi-quantum well active layer. The DL3 9-05 is suitable for applications including bar-code readers, laser pointers, and laser levels. The DL3 9-05 has a Ø5.6mm pac age.



Absolute Maximum Ratings (Tc = 5 °C)

Characteristic	Symbol	Value	Unit
Optical output power	Po	5	mW
Laser diode reverse voltage	VR(LD)	2	V
Photodiode reverse voltage	VR(PD)	30	V
Operating temperature	Topr	– 10 to + 60	°C
Storage temperature	Tstg	– 40 to + 85	°C



Package Type: Ø5.6mm

Operatin and lectrical haracteristics (Tc = 5 °C)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	Ith	–	30	50	mA	–
Operating current	Iop	–	45	60	mA	Po=5mW
Lasing Wavelength	λp	660	670	680	nm	Po=5mW
Beam divergence (parallel)	θ //	6	8	10	deg	Po=5mW, (FWHM)
Beam divergence (perpendicular)	θ ⊥	25	33	40	deg	Po=5mW, (FWHM)
Differential efficiency	η	0.15	0.3	–	mW/mA	–
Monitor current	Im	0.4	1.2	2.0	mA	Po=5mW
Astigmatism	As	–	8	–	microns	Po=5mW

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Laser Diode Specifications - Sanyo DL7032-001



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830nm /100mW / 9mm package

Absolute Maximum Ratings (Tc=25°C)

Characteristic	Symbol	Value	Unit
Optical output power	Po	100	mW
Laser diode reverse voltage	V _{R(LD)}	2	V
Photodiode reverse voltage	V _{R(PD)}	30	V
Operating temperature	T _{opr}	-10 to +50	°C
Storage temperature	T _{stg}	-40 to +85	°C

DL7032-001 9 mm Package
Internal Circuit & Pin Connections

Optical and Electrical Characteristics (Tc=25°C)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	I _{th}	-	40	60	mA	-
Operating current	I _{op}	-	140	200	mA	Po=100mW
Lasing wavelength	λ _p	810	830	840	nm	Po=100mW
Beam divergence (parallel)	θ	5	7	10	deg	Po=100mW (FWHM)
Beam divergence (perpendicular)	θ _⊥	12	18	25	deg	Po=100mW (FWHM)
Differential efficiency	η	0.5	1.0	-	mW/mA	-
Monitor current	I _m	0.10	0.50	-	mA	Po=100mW
Astigmatism	A _s	-	10	-	microns	Po=100mW

Disclaimer: The laser diode information summarized above is based on the respective diode manufacturer's commercial catalog and/or data sheet specifications. The data is presumed to be accurate; however, it is subject to change without notice. Optima makes no representation as to the accuracy of the information and does not assume any responsibility for errors or omissions contained herein. The user must refer to the manufacturers specifications for details concerning the intended application and operation, diode limitations, and safety.

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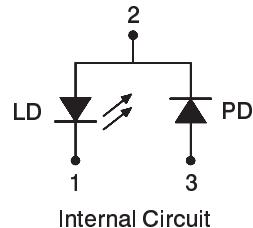
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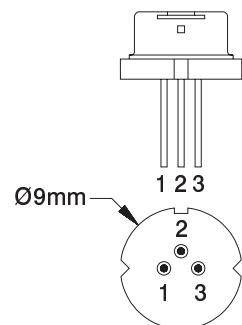
Laser Diode pe ifi a io s

The anyo DL 03 -00 is a high-power laser diode with an optical output of 100mW and a typical operating wavelength of 830nm. The DL 03 -00 has a Ø9mm package.



Absolute Maximum Ratings (Tc = 5°C)

Characteristic	Symbol	Value	Unit
Optical output power	Po	100	mW
Laser diode reverse voltage	VR(LD)	2	V
Photodiode reverse voltage	VR(PD)	30	V
Operating temperature	Topr	–10 to +50	°C
Storage temperature	Tstg	–40 to +85	°C



Package Type: Ø9mm

Operating and Electrical Characteristics (Tc = 5°C)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	Ith	–	40	60	mA	–
Operating current	Iop	–	140	200	mA	Po=100mW
Lasing Wavelength	λp	810	830	840	nm	Po=100mW
Beam divergence (parallel)	θ//	5	7	10	deg	Po=100mW, (FWHM)
Beam divergence (perpendicular)	θ⊥	12	18	25	deg	Po=100mW, (FWHM)
Differential efficiency	η	0.5	1.0	–	mW/mA	Po=100mW
Monitor current	Im	0.10	0.5	–	mA	Po=100mW
Astigmatism	As	–	10	–	microns	Po=100mW

Disclaimer: The laser diode information summarized above is based on the respective diode manufacturer's commercial catalog and/or data sheet specifications. The data is presumed to be accurate; however, it is subject to change without notice. Optima makes no representation as to the accuracy of the information and does not assume any responsibility for errors or omissions contained herein. The user must refer to the manufacturers specifications for details concerning the intended application and operation, diode limitations, and safety.

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Laser Diode Specifications - Sanyo DL8032-001



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830nm / 150mW / 9mm package

Absolute Maximum Ratings (Tc=25°C)

Characteristic	Symbol	Value	Unit
Optical output power	Po	150	mW
Laser diode reverse voltage	V _{R(LD)}	2	V
Photodiode reverse voltage	V _{R(PD)}	30	V
Operating temperature	T _{opr}	-10 to +50	°C
Storage temperature	T _{stg}	-40 to +85	°C

DL8032-001 9 mm Package
Internal Circuit & Pin Connections

Optical and Electrical Characteristics (Tc=25°C)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	I _{th}	-	40	60	mA	-
Operating current	I _{op}	-	185	230	mA	Po=150mW
Lasing wavelength	λ _p	820	830	840	nm	Po=150mW
Beam divergence (parallel)	θ	5	7	9	deg	Po=150mW (FWHM)
Beam divergence (perpendicular)	θ _⊥	15	18	22	deg	Po=150mW (FWHM)
Differential efficiency	η	0.7	1.0	-	mW/mA	-
Monitor current	I _m	0.2	1.0	-	mA	Po=150mW
Astigmatism	A _s	-	10	-	microns	Po=150mW

Disclaimer: The laser diode information summarized above is based on the respective diode manufacturer's commercial catalog and/or data sheet specifications. The data is presumed to be accurate; however, it is subject to change without notice. Optima makes no representation as to the accuracy of the information and does not assume any responsibility for errors or omissions contained herein. The user must refer to the manufacturers specifications for details concerning the intended application and operation, diode limitations, and safety.

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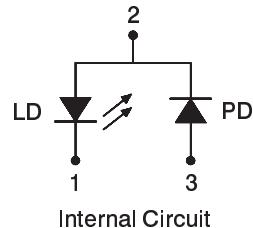
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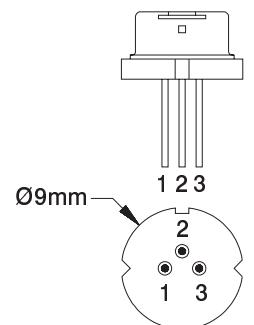
ano DL 2 Laser Diode pe ifi a io s

The anyo DL 03 -00 is a high-power laser diode with an optical output of 50mW and a typical operating wavelength of 830nm. The DL 03 -00 has a Ø9mm package.



Absolute Maximum Ratings (Tc = 5°C)

Characteristic	Symbol	Value	Unit
Optical output power	Po	150	mW
Laser diode reverse voltage	VR(LD)	2	V
Photodiode reverse voltage	VR(PD)	30	V
Operating temperature	Topr	–10 to +50	°C
Storage temperature	Tstg	–40 to +85	°C



Package Type: Ø9mm

Operating and Electrical Characteristics (Tc = 5°C)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	Ith	–	40	60	mA	–
Operating current	Iop	–	185	230	mA	Po=150mW
Lasing Wavelength	λp	820	830	840	nm	Po=150mW
Beam divergence (parallel)	θ//	5	7	9	deg	Po=150mW, (FWHM)
Beam divergence (perpendicular)	θ⊥	15	18	22	deg	Po=150mW, (FWHM)
Differential efficiency	η	0.7	1.0	–	mW/mA	–
Monitor current	Im	0.2	1.0	–	mA	Po=150mW
Astigmatism	As	–	10	–	microns	Po=150mW

Disclaimer: The laser diode information summarized above is based on the respective diode manufacturer's commercial catalog and/or data sheet specifications. The data is presumed to be accurate; however, it is subject to change without notice. Optima makes no representation as to the accuracy of the information and does not assume any responsibility for errors or omissions contained herein. The user must refer to the manufacturers specifications for details concerning the intended application and operation, diode limitations, and safety.

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Laser Diode Specifications - Sanyo DL7140-201

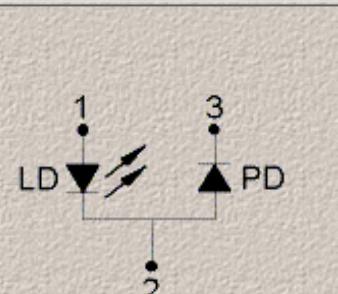


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785nm / 70mW / 5.6mm package

Absolute Maximum Ratings (Tc=25°C)

Characteristic	Symbol	Value	Unit
Optical output power	Po	80	mW
Laser diode reverse voltage	V _{R(LD)}	2	V
Photodiode reverse voltage	V _{R(PD)}	15	V
Operating temperature	T _{opr}	-10 to +60	°C
Storage temperature	T _{stg}	-40 to +85	°C



DL7140-201 5.6mm Package
Internal Circuit & Pin Connections

Optical and Electrical Characteristics (Tc=25°C)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	I _{th}	-	30	50	mA	-
Operating current	I _{op}	-	100	140	mA	Po=70mW
Lasing wavelength	λ _p	780	785	800	nm	Po=70mW
Beam divergence (parallel)	θ	5.5	7.0	8.0	deg	Po=70mW (FWHM)
Beam divergence (perpendicular)	θ _⊥	15	17	20	deg	Po=70mW (FWHM)
Differential efficiency	η	-	0.60	1.00	mW/mA	-
Monitor current	I _m	0.10	0.25	0.60	mA	Po=70mW
Astigmatism	A _s	-	10	-	microns	Po=70mW

Disclaimer: The laser diode information summarized above is based on the respective diode manufacturer's commercial catalog and/or data sheet specifications. The data is presumed to be accurate; however, it is subject to change without notice. Optima makes no representation as to the accuracy of the information and does not assume any responsibility for errors or omissions contained herein. The user must refer to the manufacturers specifications for details concerning the intended application and operation, diode limitations, and safety.

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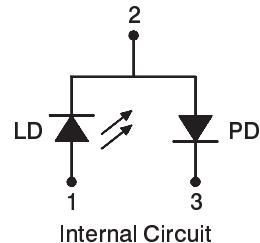
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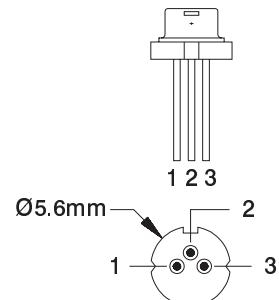
Laser Diode pe ifi a io s

The a o DL 0- 0 is a high-power, inde guided, laser diode with an optical output of 0m and a typical operating wavelength of 5nm. Possible applications include D- products and similar optical storage products. The DL 0- 0 has a Ø5.6mm pac age.



bsolute Ma imum atin s (Tc 5)

Characteristic	Symbol	Value	Unit
Optical output power	Po	80	mW
Laser diode reverse voltage	VR(LD)	2	V
Photodiode reverse voltage	VR(PD)	15	V
Operating temperature	Topr	– 10 to + 60	°C
Storage temperature	Tstg	– 40 to + 85	°C



Package Type: Ø5.6mm

Operatin and lectrical haracteristics (Tc 5)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	Ith	–	30	50	mA	–
Operating current	Iop	–	100	140	mA	Po=70mW
Lasing Wavelength	λp	780	785	800	nm	Po=70mW
Beam divergence (parallel)	θ //	5.5	7.0	8.0	deg	Po=70mW, (FWHM)
Beam divergence (perpendicular)	θ ⊥	15	17	20	deg	Po=70mW, (FWHM)
Differential efficiency	η	0.60	1.00	1.40	mW/mA	–
Monitor current	Im	0.10	0.25	0.60	mA	Po=70mW
Astigmatism	As	–	10	–	microns	Po=70mW

Disclaimer: The laser diode information summarized above is based on the respective diode manufacturer's commercial catalog and/or data sheet specifications. The data is presumed to be accurate; however, it is subject to change without notice. Optima makes no representation as to the accuracy of the information and does not assume any responsibility for errors or omissions contained herein. The user must refer to the manufacturers specifications for details concerning the intended application and operation, diode limitations, and safety.

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Laser Diode Specifications - Sanyo DL4038-021



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635nm / 10mW / 9mm package

Absolute Maximum Ratings (Tc=25°C)

Characteristic	Symbol	Value	Unit
Optical output power	Po	10	mW
Laser diode reverse voltage	V _{R(LD)}	2	V
Photodiode reverse voltage	V _{R(PD)}	30	V
Operating temperature	T _{opr}	-10 to +40	°C
Storage temperature	T _{stg}	-40 to +85	°C

DL4038-021 9mm Package
Internal Circuit & Pin Connections

Optical and Electrical Characteristics (Tc=25°C)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	I _{th}	-	35	60	mA	-
Operating current	I _{op}	-	55	80	mA	Po=10mW
Laser diode operating voltage	V _{op}	-	2.2	2.4	V	Po=10mW
Lasing wavelength	λ _p	-	635	645	nm	Po=10mW
Beam divergence (parallel)	θ //	6	8	10	deg	Po=10mW (FWHM)
Beam divergence (perpendicular)	θ ⊥	25	30	40	deg	Po=10mW (FWHM)
Differential efficiency	η	-	0.5	-	mW/mA	-
Monitor current	I _m	0.05	0.15	0.40	mA	Po=10mW
Astigmatism	A _s	-	8	-	microns	Po=10mW

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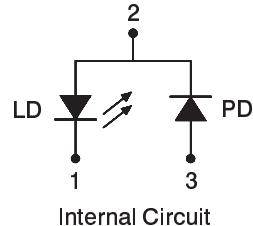
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a o DL 2

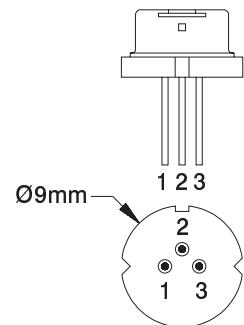
Laser Diode pe ifi a io s

The anyo DL 03-0 is an inde guided Aa nPlaser diode with a typical output of 635nm and an absolute maximum output of 10mW. The diode features low threshold current which is achieved by a strained multi-quantum well active layer. A lasing wavelength of 635nm is eight times brighter than a 630nm diode. The DL 03-0 is suitable for applications including laser printers, laser alignment systems, and laser levels. The DL 03-0 has a Ø9mm package.



Absolute Maximum Ratings (Tc = 5°C)

Characteristic	Symbol	Value	Unit
Optical output power	Po	10	mW
Laser diode reverse voltage	VR(LD)	2	V
Photodiode reverse voltage	VR(PD)	30	V
Operating temperature	Topr	–10 to +40	°C
Storage temperature	Tstg	–40 to +85	°C



Package Type: Ø9mm

Operating and Electrical Characteristics (Tc = 5°C)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	Ith	–	35	60	mA	–
Operating current	Iop	–	55	80	mA	Po=10mW
Operating voltage	Vop	–	2.2	2.4	V	Po=10mW
Lasing Wavelength	λp	–	635	645	nm	Po=10mW
Beam divergence (parallel)	θ//	6	8	10	deg	Po=10mW, (FWHM)
Beam divergence (perpendicular)	θ⊥	25	30	40	deg	Po=10mW, (FWHM)
Differential efficiency	η	–	0.5	–	mW/mA	–
Monitor current	Im	0.05	0.15	0.4	mA	Po=10mW
Astigmatism	As	–	8	–	microns	Po=10mW

Disclaimer: The laser diode information summarized above is based on the respective diode manufacturer's commercial catalog and/or data sheet specifications. The data is presumed to be accurate; however, it is subject to change without notice. Optima makes no representation as to the accuracy of the information and does not assume any responsibility for errors or omissions contained herein. The user must refer to the manufacturers specifications for details concerning the intended application and operation, diode limitations, and safety.

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Laser Diode Specifications - Sony SLD1132VS



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635nm / 5mW / 5.6mm package

Absolute Maximum Ratings (Tc=25°C)

Characteristic	Symbol	Value	Unit
Optical output power	Po	5	mW
Laser diode reverse voltage	V _{R(LD)}	2	V
Photodiode reverse voltage	V _{R(PD)}	15	V
Operating temperature	T _{opr}	-10 to +40	°C
Storage temperature	T _{stg}	-40 to +85	°C

SLD1132VS 5.6mm Package
Internal Circuit & Pin Connections

Optical and Electrical Characteristics (Tc=25°C)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	I _{th}	-	50	70	mA	-
Operating current	I _{op}	-	60	80	mA	Po=3mW
Laser diode operating voltage	V _{op}	-	2.4	3.0	V	Po=3mW
Lasing wavelength	λ _p	625	635	645	nm	Po=3mW
Beam divergence (FWHM)	θ //	5	7	12	deg	Po=3mW
Beam divergence (FWHM)	θ ⊥	24	32	40	deg	Po=3mW
Differential efficiency	η	0.15	0.35	0.8	mW/mA	Po=3mW
Monitor current	I _m	0.05	0.10	0.30	mA	Po=3mW, V _{R(PD)} =5V
Astigmatism	A _s	-	-	20	microns	-

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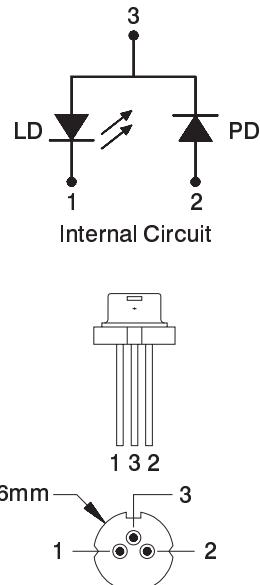
o LD 2

Laser Diode pe ifi a io s

The only LD 3 V is a Al a nP visible laser diode that's designed for laser pointers. The operating wavelength of 635nm is approximately seven times brighter than a typical 630nm laser diode. The diode has a quantum well structure and single longitudinal mode. The LD 3 V has a 5.6mm package.

Absolute Maximum Ratings (Tc = 5 °C)

Characteristic	Symbol	Value	Unit
Optical output power	Po	5	mW
Laser diode reverse voltage	VR(LD)	2	V
Photodiode reverse voltage	VR(PD)	15	V
Operating temperature	Topr	–10 to +40	°C
Storage temperature	Tstg	–40 to +85	°C



Operating and Electrical Characteristics (Tc = 5 °C)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	Ith	–	50	70	mA	–
Operating current	Iop	–	60	80	mA	Po=3mW
Differential efficiency	η	0.15	0.35	0.8	mW/mA	Po=3mW
Operating voltage	Vop	–	2.4	3.0	V	Po=3mW
Lasing Wavelength	λp	625	635	645	nm	Po=3mW
Beam divergence (parallel)	θ//	5	7	12	deg	Po=3mW, (FWHM)
Beam divergence (perpendicular)	θ⊥	24	32	40	deg	Po=3mW, (FWHM)
Monitor current	Im	0.05	0.10	0.30	mA	Po=3mW, VR(PD)=5V
Astigmatism	As	–	–	20	microns	–

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Laser Diode Specifications - Sony SLD1134VL



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655nm / 5mW / 5.6mm package

Absolute Maximum Ratings (Tc=25°C)

Characteristic	Symbol	Value	Unit
Optical output power	Po	5	mW
Laser diode reverse voltage	VR(LD)	2	V
Photodiode reverse voltage	VR(PD)	20	V
Operating temperature	Topr	-10 to +70	°C
Storage temperature	Tstg	-40 to +85	°C

SLD1134VL 5.6mm Package
Internal Circuit & Pin Connections

Optical and Electrical Characteristics (Tc=25°C)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	Ith	-	65	80	mA	-
Operating current	Iop	-	75	90	mA	Po=4mW
Laser diode operating voltage	Vop	-	2.3	2.8	V	Po=4mW
Lasing wavelength	λp	640	655	660	nm	Po=4mW
Beam divergence (FWHM)	θ //	7	8.5	12	deg	Po=4mW
Beam divergence (FWHM)	θ ⊥	25	35	40	deg	Po=4mW
Differential efficiency	η	0.15	0.4	0.7	mW/mA	Po=4mW
Monitor current	Im	0.05	0.10	0.25	mA	Po=4mW, VR(PD)=5V
Astigmatism	As	-	10	-	microns	-

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Laser Diode Specifications - Toshiba TOLD9441MC

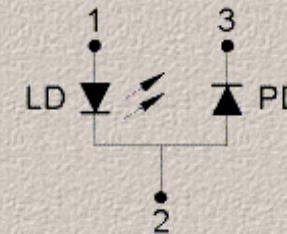


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650nm / 7mW / 5.6mm package

Absolute Maximum Ratings (Tc=25°C)

Characteristic	Symbol	Value	Unit
Optical output power	Po	7	mW
Laser diode reverse voltage	V _{R(LD)}	2	V
Photodiode reverse voltage	V _{R(PD)}	30	V
Operating temperature	T _{opr}	-10 to +70	°C
Storage temperature	T _{stg}	-40 to +85	°C



TOLD9441MC 5.6mm Package
Internal Circuit & Pin Connections

Optical and Electrical Characteristics (Tc=25°C)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	I _{th}	-	40	70	mA	-
Operating current	I _{op}	-	50	80	mA	Po=5mW
Laser diode operating voltage	V _{op}	-	2.2	3.0	V	Po=5mW
Lasing wavelength	λ _p	640	650	660	nm	Po=5mW
Beam divergence (parallel)	θ //	5	8	12	deg	Po=5mW (FWHM)
Beam divergence (perpendicular)	θ ⊥	24	28	35	deg	Po=5mW (FWHM)
Monitor current	I _m	0.07	0.25	0.5	mA	Po=5mW
Photodiode dark current	I _{D(PD)}	-	-	100	nA	VR=5V

Photodiode total capacitance	CT (PD)	-	-	20	pF	VR=5V, f=1MHz
Astigmatism	As	-	8	-	microns	Po=5mW

Disclaimer: The laser diode information summarized above is based on the respective diode manufacturer's commercial catalog and/or data sheet specifications. The data is presumed to be accurate; however, it is subject to change without notice. Optima makes no representation as to the accuracy of the information and does not assume any responsibility for errors or omissions contained herein. The user must refer to the manufacturers specifications for details concerning the intended application and operation, diode limitations, and safety.

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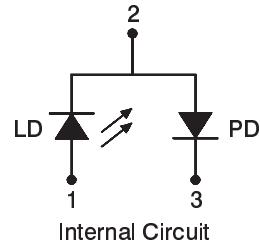
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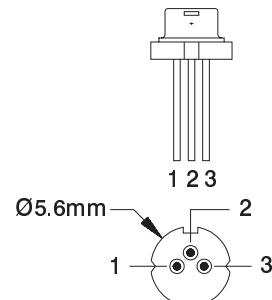
Laser Diode pe ifi a io s

The Toshiba TOLD9 is an edge guided laser diode with a multi-quantum well structure. Developed for DVD applications, the TOLD9 has a maximum optical output of 7mW and a typical operating wavelength of 650nm. With an extended operating temperature of -40°C to +85°C and a visible beam, the diode is also applicable to other industrial products such as bar-code readers and laser alignment systems. The TOLD9 has a Ø5.6mm package.



Absolute Maximum Ratings (Tc = 5°C)

Characteristic	Symbol	Value	Unit
Optical output power	Po	7	mW
Laser diode reverse voltage	VR(LD)	2	V
Photodiode reverse voltage	VR(PD)	30	V
Operating temperature	Topr	-40 to +85	°C
Storage temperature	Tstg	-40 to +85	°C



Package Type: Ø5.6mm

Operating and Electrical Characteristics (Tc = 5°C)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	Ith	—	40	70	mA	—
Operating current	Iop	—	50	80	mA	Po=5mW
Operating voltage	Vop	—	2.2	3.0	V	Po=5mW
Lasing Wavelength	λp	640	650	660	nm	Po=5mW
Beam divergence (parallel)	θ //	5	8	12	deg	Po=5mW, (FWHM)
Beam divergence (perpendicular)	θ ⊥	24	28	35	deg	Po=5mW, (FWHM)
Monitor current	Im	0.07	0.25	0.5	mA	Po=5mW
Photodiode dark current	ID(PD)	—	—	100	nA	VR(PD)=5V
Photodiode total capacitance	CT(PD)	—	—	20	pF	VR(PD)=5V, f=1MHz
Astigmatism	As	—	8	—	microns	—

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Laser Diode Specifications - Toshiba TOLD9442M

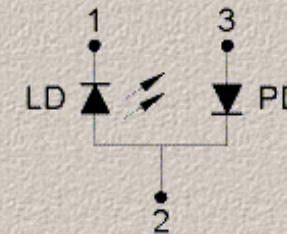


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650nm / 5mW / 5.6mm package

Absolute Maximum Ratings (Tc=25°C)

Characteristic	Symbol	Value	Unit
Optical output power	Po	5	mW
Laser diode reverse voltage	V _{R(LD)}	2	V
Photodiode reverse voltage	V _{R(PD)}	30	V
Operating temperature	T _{opr}	-10 to +60	°C
Storage temperature	T _{stg}	-40 to +85	°C



TOLD9442M 5.6mm Package
Internal Circuit & Pin Connections

Optical and Electrical Characteristics (Tc=25°C)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	I _{th}	-	30	55	mA	-
Operating current	I _{op}	-	35	60	mA	Po=5mW
Laser diode operating voltage	V _{op}	-	2.2	3.0	V	Po=5mW
Lasing wavelength	λ _p	645	650	655	nm	Po=5mW
Beam divergence (parallel)	θ //	5	8	12	deg	Po=5mW (FWHM)
Beam divergence (perpendicular)	θ ⊥	24	28	35	deg	Po=5mW (FWHM)
Monitor current	I _m	0.07	0.25	0.35	mA	Po=5mW
Photodiode dark current	I _{D (PD)}	-	-	100	nA	VR=5V

Photodiode total capacitance	CT (PD)	-	-	20	pF	VR=5V, f=1MHz
Astigmatism	As	-	8	-	microns	-

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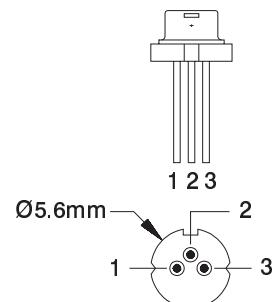
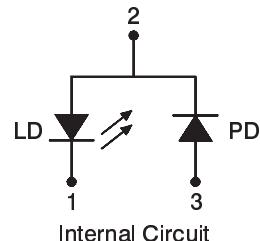
Laser Diode pe ifi a io s

The Toshiba TOLD9 is a general purpose, index guided laser diode with a multi-quantum well structure. Developed for DVD products, the TOLD9 has a maximum optical output of 5mW and a typical operating wavelength of 650nm.

With its short wavelength, the highly visible beam is applicable to other industrial products such as bar-code readers and laser alignment systems. The TOLD9 has a Ø5.6mm package.

Absolute Maximum Ratings (Tc = 5°C)

Characteristic	Symbol	Value	Unit
Optical output power	Po	5	mW
Laser diode reverse voltage	VR(LD)	2	V
Photodiode reverse voltage	VR(PD)	30	V
Operating temperature	Topr	-10 to +60	°C
Storage temperature	Tstg	-40 to +85	°C



Operating and Electrical Characteristics (Tc = 5°C)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	Ith	—	30	55	mA	—
Operating current	Iop	—	35	60	mA	Po=5mW
Operating voltage	Vop	—	2.2	3.0	V	Po=5mW
Lasing Wavelength	λp	645	650	655	nm	Po=5mW
Beam divergence (parallel)	θ //	5	8	12	deg	Po=5mW, (FWHM)
Beam divergence (perpendicular)	θ ⊥	24	28	35	deg	Po=5mW, (FWHM)
Monitor current	Im	0.07	0.25	0.35	mA	Po=5mW
Photodiode dark current	ID(PD)	—	—	100	nA	VR(PD)=5V
Photodiode total capacitance	CT(PD)	—	—	20	pF	VR(PD)=5V, f=1MHz
Astigmatism	As	—	8	—	microns	—

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Laser Diode Specifications - Toshiba TOLD9231M

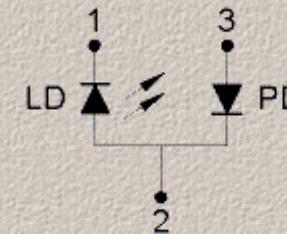


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670nm / 5mW / 5.6mm package

Absolute Maximum Ratings (Tc=25°C)

Characteristic	Symbol	Value	Unit
Optical output power	Po	5	mW
Laser diode reverse voltage	V _{R(LD)}	2	V
Photodiode reverse voltage	V _{R(PD)}	30	V
Operating temperature	T _{opr}	-10 to +60	°C
Storage temperature	T _{stg}	-40 to +85	°C



TOLD9231M 5.6mm Package
Internal Circuit & Pin Connections

Optical and Electrical Characteristics (Tc=25°C)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	I _{th}	-	50	75	mA	-
Operating current	I _{op}	-	60	85	mA	Po=5mW
Laser diode operating voltage	V _{op}	-	2.3	3.0	V	Po=5mW
Lasing wavelength	λ _p	660	670	680	nm	Po=5mW
Beam divergence (parallel)	θ //	7	10	16	deg	Po=5mW (FWHM)
Beam divergence (perpendicular)	θ ⊥	26	32	38	deg	Po=5mW (FWHM)
Monitor current	I _m	0.25	0.9	1.7	mA	Po=5mW
Photodiode dark current	I _{D (PD)}	-	-	100	nA	VR=5V

Photodiode total capacitance	CT (PD)	-	-	20	pF	VR=5V, f=1MHz
Astigmatism	As	-	40	-	microns	-

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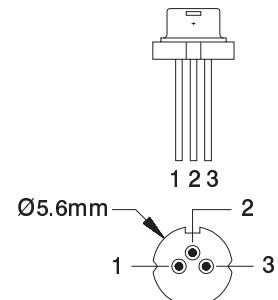
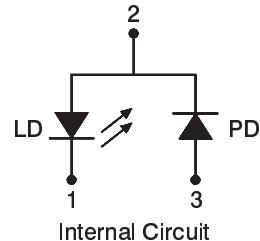
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Laser Diode pe ifi a io s

The Toshiba TOLD9 3 is a gain guided laser diode with a multi-quantum well structure. The maximum optical output is 5mW and the typical operating wavelength is 630nm. The TOLD9 3 is a multi-mode diode which is applicable to products such as bar-code readers, alignment systems and measurement systems. The TOLD9 3 has a Ø5.6mm package.

Absolute Maximum Ratings (Tc = 5°C)

Characteristic	Symbol	Value	Unit
Optical output power	Po	5	mW
Laser diode reverse voltage	VR(LD)	2	V
Photodiode reverse voltage	VR(PD)	30	V
Operating temperature	Topr	-10 to +60	°C
Storage temperature	Tstg	-40 to +85	°C



Package Type: Ø5.6mm

Operating and Electrical Characteristics (Tc = 5°C)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Threshold current	Ith	–	50	75	mA	–
Operating current	Iop	–	60	85	mA	Po=5mW
Operating voltage	Vop	–	2.3	3.0	V	Po=5mW
Lasing Wavelength	λp	660	670	680	nm	Po=5mW
Beam divergence (parallel)	θ //	7	10	16	deg	Po=5mW, (FWHM)
Beam divergence (perpendicular)	θ ⊥	26	32	38	deg	Po=5mW, (FWHM)
Monitor current	Im	0.25	0.9	1.7	mA	Po=5mW
Photodiode dark current	ID(PD)	–	–	100	nA	VR(PD)=5V
Photodiode total capacitance	CT(PD)	–	–	20	pF	VR(PD)=5V, f=1MHz
Astigmatism	As	–	40	–	microns	–

Disclaimer: The laser diode information summarized above is based on the respective diode manufacturer's commercial catalog and/or data sheet specifications. The data is presumed to be accurate; however, it is subject to change without notice. Optima makes no representation as to the accuracy of the information and does not assume any responsibility for errors or omissions contained herein. The user must refer to the manufacturers specifications for details concerning the intended application and operation, diode limitations, and safety.

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