

CAY033 - August 16, 2023

Item # CAY033 was discontinued on August 16, 2023. For informational purposes, this is a copy of the website content at that time and is valid only for the stated product.

MOLDED PLASTIC ASPHERIC LENSES, UNCOATED

- Optical-Grade Plastic
- Designed for 670 nm or 785 nm
- Near Diffraction-Limited Performance



A Laser Diode is Collimated Using a CAY046 Plastic Aspheric Lens in an SM1AD8 Adapter Mounted to an LDM21 Laser Diode Mount

OVERVIEW

Features

- Material: Optical-Grade Plastic
- Outer Diameters of 5.20 mm, 6.28 mm, and 7.40 mm Available
- Effective Focal Lengths from 3.30 mm to 18.15 mm
- Individual and Packaged Options Available

Our Plastic Aspheric Lenses, which are available uncoated or with an antireflection coating for the 400 - 700 nm range, utilize molding technology to produce all-plastic optics. Designed by Philips for high-volume applications at affordable prices, these optics are ideal for low-power applications requiring lightweight components. The surface of the aspheric lens is designed to eliminate spherical aberration, which allows for the spot size and collimation of a monochromatic beam of light to approach the diffraction limit. All our plastic aspheric lenses are available individually. Select lenses are also offered in packages of 25, 50, or 100 pieces at a discount of 16%, 33%, and 50%, respectively, over the individual lens price.

In laser diode systems, difficulties with aberration correction are compounded by the beam's high divergence angle. Since individual spherical lenses can refract light at only small angles before spherical aberration is introduced, multiple elements are often required to collimate laser diode light. In contrast, a single aspheric lens collimates without introducing spherical aberration. When used to collimate or focus light, the lens should be oriented so that the side with a larger radius of curvature (i.e., the flatter surface) faces the point source.

Conversely, when coupling into fiber, it is often necessary to focus the laser light to a near-diffraction-limited spot. With single spherical elements, spherical aberration, rather than diffraction limit, serves as the limiting factor to achieving such a small spot size. The diffraction-limiting design of these aspheric lenses helps to minimize spherical aberration, allowing the focal spot size to approach the diffraction limit.

All of the plastic aspheric lenses on this page are corrected for the presence of a window, like the window in TO-type laser packages. Please see the *Specs* tab for details. Additionally, the side of each lens has a flat indent that provides a reference location.



Click to Enlarge

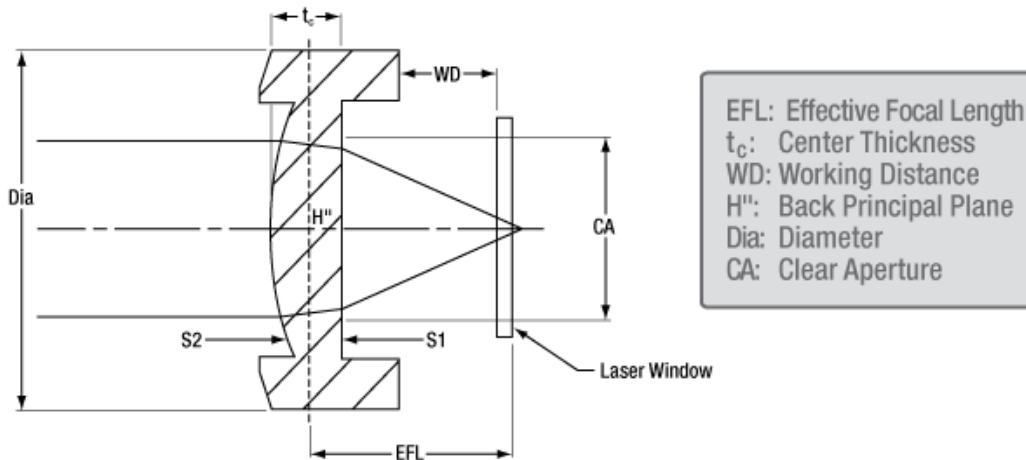
Select aspheres are available in bulk at a discounted price. These items come prepackaged in capsules as shown here.



S P E C S

Item #	CAY033	CAY046	CAW100	CAX100	CAW110	CAX183
Effective Focal Length	3.32 mm	4.60 mm	9.85 mm	10.0 mm	10.92 mm	18.15 mm
Numerical Aperture	0.40	0.40	0.195	0.2	0.19	0.12
Clear Aperture	Ø2.70 mm	Ø3.7 mm	Ø3.4 / Ø3.9 mm (S1 / S2) ^c	Ø4.1 mm	Ø4.1 mm	Ø4.3 mm
Working Distance ^a	2.00 mm	3.00 mm	4.69 mm	8.48 mm	9.33 mm	16.30 mm
Outer Diameter	7.40 mm	7.40 mm	5.20 mm	6.28 mm	6.28 mm	6.28 mm
Center Thickness	2.70 mm	2.70 mm	2.52 mm	1.25 mm	-	1.09 mm
Wavefront Error, On Axis ^b (RMS)	0.040λ	0.040λ	0.040λ	0.080λ	0.040λ	0.030λ
Wavefront Error, Total ^b (RMS)	0.065λ	0.070λ	0.050λ	0.090λ	0.055λ	0.035λ
Surface Quality	80-50 Scratch-Dig					
Material	Acrylic	Acrylic	Cyclic Olefin Copolymer	Polycarbonate	Cyclic Olefin Copolymer	Polycarbonate
Design Wavelength	785 nm	670 nm	785 nm	670 nm	670 nm	670 nm
AR Coating Wavelength (>95% Transmission)	785 nm	None				
Laser Window Correction	0.25 mm (N-BK7)	0.25 mm (N-BK7)	5 mm (N-SF11)	0.25 mm (N-BK7)	0.25 mm (N-BK7)	0.25 mm (N-BK7)
Operating Temperature	5 to 65 °C	5 to 65 °C	0 to 65 °C	0 to 65 °C	-10 to 75 °C	-10 to 75 °C
Storage Temperature	-25 to 70 °C	-10 to 70 °C	0 to 65 °C	0 to 65 °C	-25 to 100 °C	-25 to 100 °C

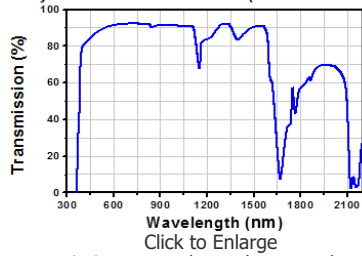
- a. Measured as Shown in the Diagram Below
- b. Measured at the Design Wavelength
- c. As Labeled in the Diagram Below



Please note the effective focal length is determined from the back principal plane, which does not coincide with the flat surface of the lens.

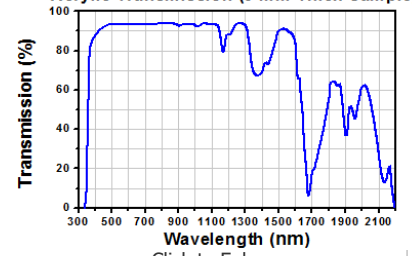
G R A P H S

Polycarbonate Transmission (3 mm Thick Sample)



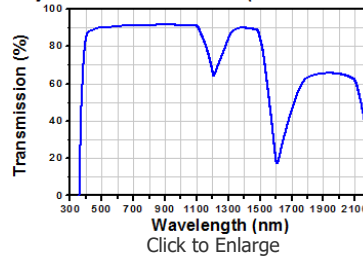
The transmission curve above shows total transmission through polycarbonate, including surface reflections. Our CAX100 and CAX183 plastic aspheric lenses are fabricated from this material.

Acrylic Transmission (3 mm Thick Sample)



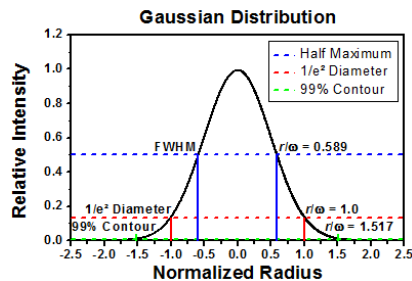
The transmission curve above shows total transmission through acrylic, including surface reflections. Our CAY046 plastic aspheric lens is fabricated from this material.

Cyclic Olefin Transmission (3 mm Thick Sample)



The transmission curve above shows total transmission through cyclic olefin copolymer, including surface reflections. Our CAW100 and CAW110 plastic aspheric lenses are fabricated from this material.

TUTORIAL



The graph shows a plot of the intensity distribution of a Gaussian beam with common methods of defining the beam diameter. For Gaussian calculations the $1/e^2$ diameter is used. The intensity of a Gaussian beam is given by:

$$I(r) = I_0 e^{-\frac{2r^2}{\omega^2}}$$

Where $I(r)$ is the radial intensity of the beam, I_0 is the on-axis intensity, r is the radial distance, and ω is the radius of the beam where $I(r)$ falls to $1/e^2$. To focus collimated laser light into a single mode fiber, the $1/e^2$ radius at the beam waist (focal point of the beam) should be equal to half the mode field diameter of the fiber. For a $M^2 = 1$ beam, select a lens with a focal length, f , determined using:

$$f = \frac{D\pi\omega_0}{2\lambda}$$

where λ is the wavelength of the light, D is the $1/e^2$ diameter of the beam incident on the lens, and ω_0 is the radius at the beam waist.

Plastic Aspheric Lenses (Individual)

Part Number	Description	Price	Availability
CAY046	Plastic Aspheric Lens, Ø7.40 mm, f = 4.60 mm, 0.40 NA	\$14.33 Volume Pricing Available	Today
CAW100	Plastic Aspheric Lens, Ø5.20 mm, f = 9.85 mm, 0.195 NA	\$14.33 Volume Pricing Available	Today
CAX100	Plastic Aspheric Lens, Ø6.28 mm, f = 10.0 mm, 0.2 NA	\$14.33 Volume Pricing Available	Today
CAW110	Plastic Aspheric Lens, Ø6.28 mm, f = 10.92 mm, 0.19 NA	\$14.33 Volume Pricing Available	Today
		\$14.33	

CAX183	Plastic Aspheric Lens, Ø6.28 mm, f = 18.15 mm, 0.12 NA	Volume Pricing Available	Today
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Plastic Aspheric Lenses (25 Pack, 16% Savings)

Part Number	Description	Price	Availability
CAY046-25	Plastic Aspheric Lens, Ø7.40 mm, f = 4.60 mm, 0.40 NA, 25 Pack	\$298.44	Today
CAX100-25	Plastic Aspheric Lens, Ø6.28 mm, f = 10.0 mm, 0.2 NA, 25 Pack	\$298.44	Today
CAX183-25	Plastic Aspheric Lens, Ø6.28 mm, f = 18.15 mm, 0.12 NA, 25 Pack	\$298.44	Today

Plastic Aspheric Lenses (50 Pack, 33% Savings)

Part Number	Description	Price	Availability
CAY046-50	Plastic Aspheric Lens, Ø7.40 mm, f = 4.60 mm, 0.40 NA, 50 Pack	\$477.50	Today
CAX183-50	Plastic Aspheric Lens, Ø6.28 mm, f = 18.15 mm, 0.12 NA, 50 Pack	\$477.50	Today

Plastic Aspheric Lenses (100 Pack, 50% Savings)

Part Number	Description	Price	Availability
CAY046-100	Plastic Aspheric Lens, Ø7.40 mm, f = 4.60 mm, 0.40 NA, 100 Pack	\$716.25	Today
CAX183-100	Plastic Aspheric Lens, Ø6.28 mm, f = 18.15 mm, 0.12 NA, 100 Pack	\$716.25	Today

Acrylic Transmission (3 mm Thick Sample)

