SureLock™

TO-can Stabilized Laser Diodes

Attalon's TO-can Stabilized Laser Diode is a single transverse and longitudinal mode laser packaged in a standard TO-can form factor. This cost-effective laser features standard package design, extremely narrow linewidth, broad temperature operating range, and low power consumption, making it ideal for a wide array of analytical instrumentation and metrology applications.

All SureLock™ Series lasers utilize the Attalon PowerLocker™ Volume Holographic Grating (VHG) for stabilization, providing precise, ultra-stable center wavelengths, minimal temperature dependence, and consistent spectral performance within the stabilized temperature region.

FEATURES

- Single frequency performance at <300 MHz linewidth
- Cost-effective, instrumentation-grade performance for measurement systems
- Low power consumption
- Wavelength stability across stabilized temperature range operating range
- Widely recognized standard TO-can form factor for ease of integration
- Custom power, wavelengths and tolerances available

APPLICATIONS

- HeNe Replacement
- Wavelength reference source
- Raman Spectroscopy
- Metrology
- Bio-instrumentation
- Particle Counting
- Sensing and Environmental Monitoring
- Interferometry
- Holography
- Analytical Instrumentation
- Precision Manufacturing

Attalon

Specifications	TO-640 nm 20 mW	TO-638 nm 32 mW	TO-640 nm 32 mW
SKU	115-81045-003	115-81045-012	115-81045-013
Spatial Mode	Single Mode		
Output Power (mW) Maximum	20	32	32
Center Wavelength[1] (nm) Minimum Typical Maximum	639 640 641	637 638 639	639 640 641
Typical Linewidth (MHz)	300	300	300
Central Stabilized Temperature (°C) Minimum Maximum	15 45	15 45	15 45
Stabilized Temperature Range (°C) Minimum Typical	10 14	10 14	10 14
Threshold Current (mA) Typical Maximum	45 60	45 60	45 60
Operating Current (mA) Typical Maximum	70 100	80 105	80 105
Operating Voltage (V) Typical Maximum	2.4 2.6	2.4 2.6	2.4 2.6
Monitoring Output Current (mA) Minimum Typical Maximum	0.07 0.15 0.2	0.07 0.15 0.2	0.07 0.15 0.2
Photodiode Reverse Voltage (V) Maximum	30	30	30
Laser Reverse Voltage (V) Maximum	2	2	2
Beam Divergence, Perpendicular (Degree) Minimum Typical Maximum	16 21 24	16 21 24	16 21 24
Beam Divergence, Parallel (Degree) Minimum Typical Maximum	7 10 13	7 10 13	7 10 13

Specifications	TO-640 nm 20 mW	TO-638 nm 32 mW	TO-640 nm 32 mW
Differential Efficiency (mW/mA)	1	1	1
Polarization, Typical	60:1	60:1	60:1
Polarization Orientation	TM	TM	TM
Pin out (Pin 1, Pin 2, Pin 3)	PC,PA-LC,LA	PC,PA-LC,LA	PC,PA-LC,LA
Linewidth Units	MHz	MHz	MHz
Operating Requirements			
Operating Temperature[2] (°C) Minimum Maximum	 0 50	 0 50	 0 50
Storage Temperature[2] (°C) Minimum Maximum	 -10 60	 -10 60	 -10 60

All specifications are at rated power with a case temperature within stabilized temperature range unless otherwise noted.

[1] Wavelengths specified are vacuum referenced. Ex: 632.991nm vacuum referenced is equivalent to 632.816nm standard air referenced for HeNe

[2] Non-condensing.

Specifications	TO-658 nm 40 mW	TO-660 nm 40 mW	TO-687 nm 45 mW
SKU	115-ER328-025	115-ER328-023	115-81041-009
Spatial Mode	Single Mode		
Output Power (mW), Maximum	40	40	45
Center Wavelength[1] (nm)			
Minimum	657	659	686
Typical	658	660	687
Maximum	659	661	688
Typical Linewidth (MHz)	300	300	300
Central Stabilized Temperature (°C)			
Minimum	15	15	15
Maximum	40	40	40
Stabilized Temperature Range (°C)			
Minimum	10	10	10
Typical	15	15	15
Threshold Current (mA)			
Typical	55	55	35
Maximum	70	70	60
Operating Current (mA)			
Typical	100	100	75
Maximum	135	135	140
Operating Voltage (V)			
Minimum	-	-	2
Typical	2.5	2.5	2.7
Maximum	2.8	2.8	3
Monitoring Output Current (mA)			
Minimum	0.05	0.05	0.05
Typical	0.3	0.3	0.3
Maximum	0.6	0.6	2.5
Photodiode Reverse Voltage (V)			
Maximum	-	-	30
Laser Reverse Voltage (V)			
Maximum	-	-	2
Beam Divergence, Perpendicular (Degree)			
Minimum	-	-	16
Typical	14	14	20
Maximum	-	-	25
Beam Divergence, Parallel (Degree)			
Minimum	-	-	8
Typical	10	10	10.5
Maximum	-	-	14

Specifications	TO-658 nm 40 mW	TO-660 nm 40 mW	TO-687 nm 45 mW
Off Axis Angle, Perpendicular (Degree) Minimum Maximum	- -	- -	-2.5 2.5
Off Axis Angle, Parallel (Degree) Minimum Maximum	- -	- -	-2 2
Emitter Size (micron)	-	-	-
Differential Efficiency (mW/mA)	1.1	1.1	0.9
Polarization, Typical	100:1	100:1	100:1
Polarization Orientation	TE	TE	TE
Pin out (Pin 1, Pin 2, Pin 3)	PA,PC-LA,LC	PA,PC-LA,LC	PA,PC-LA,LC
Astigmatism (mm)	-	-	8
Linewidth Units	MHz	MHz	MHz
Operating Requirements			
Operating Temperature[2] (°C) Minimum Maximum	0 50	0 50	0 50
Storage Temperature[2] (°C) Minimum Maximum	-10 60	-10 60	-10 60

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[1] Wavelengths specified are vacuum referenced. Ex: 632.991nm vacuum referenced is equivalent to 632.816nm standard air referenced for HeNe
[2] Non-condensing.

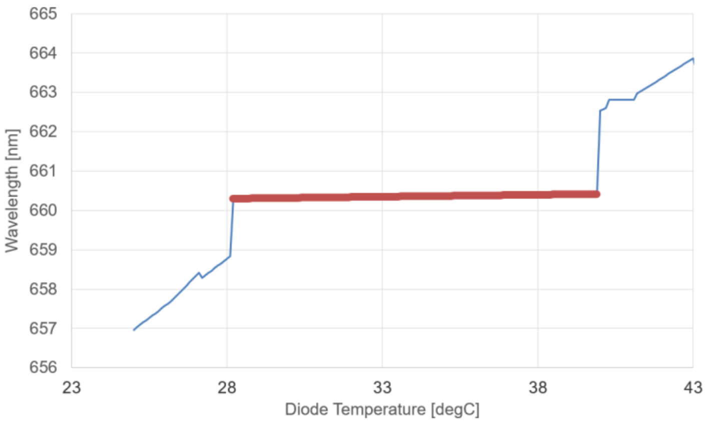
Specifications	TO-690 nm 45 mW	TO-785 nm 80 mW	TO-785 nm 100 mW
SKU	115-81039-016	115-ER255-008	115-ER255-006
Spatial Mode	Single Mode		
Output Power (mW), Maximum	45	80	100
Center Wavelength[1] (nm) Minimum Typical Maximum	689 690 691	784.5 785 785.5	784.5 785 785.5
Typical Linewidth (MHz)	100	300	300
Central Stabilized Temperature (°C) Minimum Maximum	15 40	15 40	15 40
Stabilized Temperature Range (°C) Minimum Typical	10 15	10 15	10 15
Threshold Current (mA) Typical Maximum	30 60	35 55	35 55
Operating Current (mA) Typical Maximum	75 120	105 160	125 160
Operating Voltage (V) Typical Maximum	2.3 3	2.3 -	2.3 -
Monitoring Output Current (mA) Minimum Typical Maximum	0.08 0.15 0.35	0.1 0.5 0.7	0.1 0.5 0.7
Photodiode Reverse Voltage (V) Maximum	30	-	-
Laser Reverse Voltage (V) Maximum	2	2	2
Beam Divergence, Perpendicular (Degree) Minimum Typical Maximum	18 21 25	15 17 19	15 17 19
Beam Divergence, Parallel (Degree) Minimum Typical Maximum	7 9 12	8 9 10	8 9 10

Specifications	TO-690 nm 45 mW	TO-785 nm 80 mW	TO-785 nm 100 mW
Off Axis Angle, Perpendicular (Degree) Minimum Maximum	- -	-2 2	-2 2
Off Axis Angle, Parallel (Degree) Minimum Maximum	- -	-2 2	-2 2
Emitter Size (micron)	2x3	0.9x2.1	0.9x2.1
Differential Efficiency (mW/mA)	1.1	1.1	1.1
Polarization Orientation	TE	TE	TE
Pin out (Pin 1, Pin 2, Pin 3)	PC,PA-LC,LA	PC,PA-LC,LA	PC,PA-LC,LA
Astigmatism (mm)	1	-	-
Linewidth Units	MHz	MHz	MHz
Operating Requirements			
Operating Temperature[3] (°C) Minimum Maximum	0 50	0 50	0 50
Storage Temperature[3] (°C) Minimum Maximum	-10 60	-10 60	-10 60

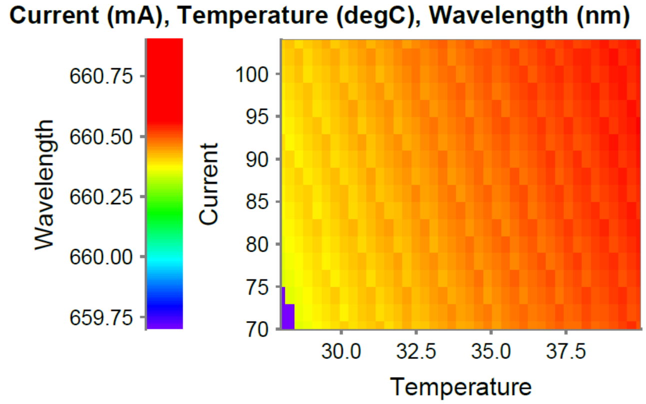
All specifications are at rated power with a case temperature within stabilized temperature range unless otherwise noted.
[1] Wavelengths specified are vacuum referenced. Ex: 632.991nm vacuum referenced is equivalent to 632.816nm standard air referenced for HeNe
[2] Non-condensing.

Typical Performance

Stabilized Temperature Range Example



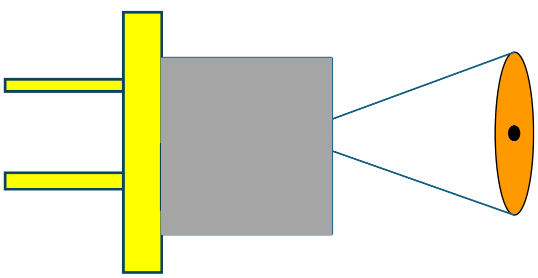
Mode Hope Performance within Stabilized Temperature Range Example



Beam Profile of a Wavelength Stabilized Diode

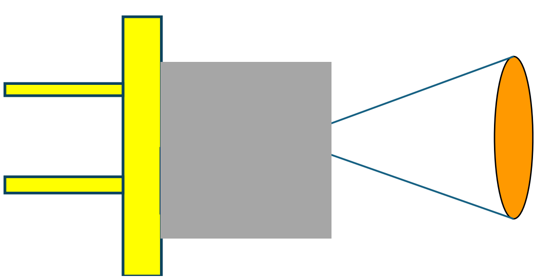
The compact design of TO-can volume-holographic-grating (VHG) stabilized diodes results in an artifact in the spatial beam profile. The VHG selectively diffracts light from the central light cone emitted by the diode to provide the wavelength-stabilizing optical feedback. The presence of a round region with reduced optical intensity, “black dot”, in the beam profile indicates that the laser is locked to a single, narrow-band wavelength. This region is typical a few degrees at or near center of the elliptical output cone. Low M^2 values and reasonable single mode fiber coupling efficiencies remain achievable with these diodes.

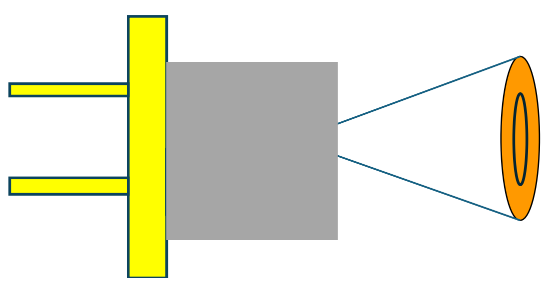
Stabilized beam profile showing a central region with reduced light intensity



When the wavelength is not stabilized, the central region brightens up or might develop a ring structure

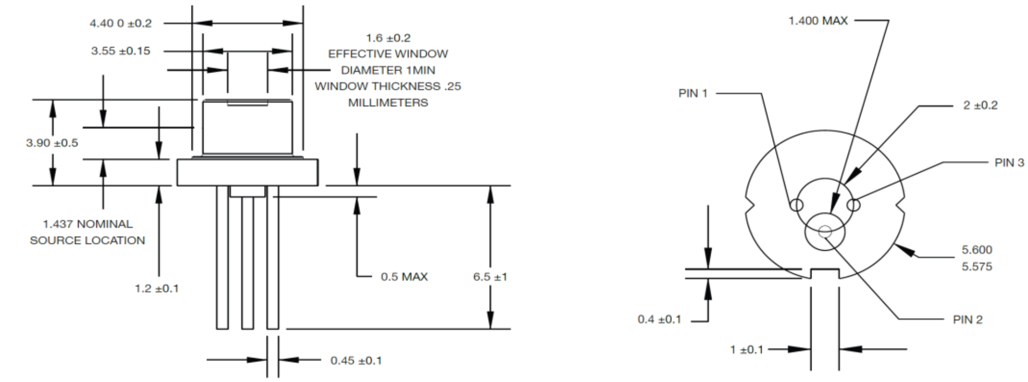
Unstabilized beam profile



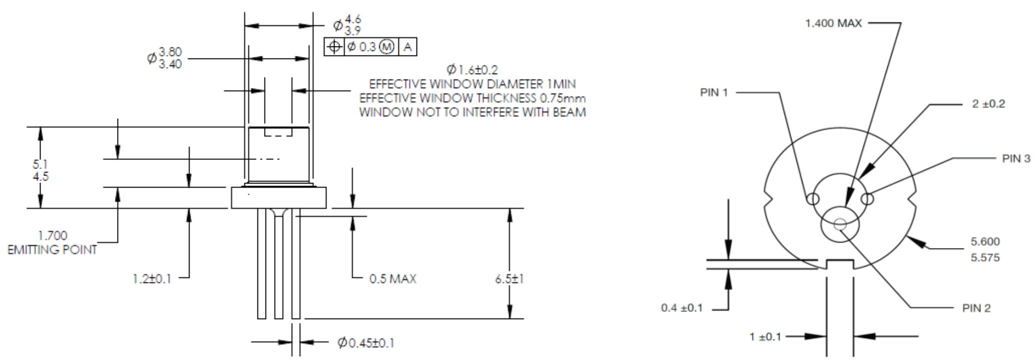


Outline Drawing (all dimensions in mm)

Size A

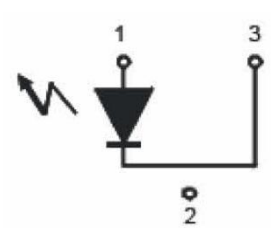


Size B

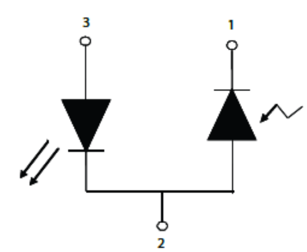


Pinout

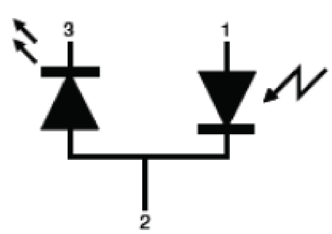
-001 : LA,-,LC



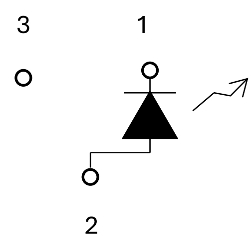
-003 : PC,PA-LC,LA



-002 : PA,PC-LA,LC



-004 : -,LA,LC



Warnings:

Electrostatic Discharge (ESD): Laser diodes are highly sensitive to electrostatic discharge (ESD) and voltage transients. Proper ESD procedures must be followed when handling laser diodes. Laser diodes are delivered in a conductive protective bag. When not in use, the laser anode and cathode electrical contacts should be shorted together to prevent ESD damage. Create a static free work environment. All personnel and tools that come into contact with the laser are continuously grounded, such as by using a grounding wrist strap. Electrostatic discharges could create latent damage that shorten lifetime of a diode.

Optical Feedback: Semiconductor laser diodes are highly sensitive to optical feedback, which can cause latent damage that may not be immediately apparent. Wavelength-stabilized laser diodes are particularly vulnerable and may lose their spectral characteristics, such as center wavelength and linewidth, when exposed to sufficient optical feedback.

To prevent these issues, optical isolators must be used in applications where optical feedback is intrinsic. Avoid focusing the light output on highly reflective surfaces, as this generates optical feedback to the laser diode. For fiber-coupled applications, angled and anti-reflective (AR) coated fiber tips are recommended. All reflective surfaces in the optical path should be angled to prevent reflections from being directed back to the laser diode.

During optical alignments near normal incidence, use an optical isolator or optical density (OD) filter to eliminate the risk of brief high-intensity optical feedback. Be cautious with wavelength-sensitive elements such as narrow bandpass filters. Angularly sweeping the alignment of such elements can cause sufficient feedback to briefly unlock the diodes which would generate high-intensity reflected off-wavelength light, significantly increasing the risk of damage to the laser diode.

Laser Eye Safety: These diodes are intended for use in OEM applications. Use protective eyewear and follow local regulatory requirements for use of laser diodes.

Environmental Conditions: For some highly sensitive wavelength reference applications, environment and ambient conditions need to be considered. Air movement and ambient temperature swings may affect performance in those applications.

Mounting Considerations: Avoid applying stress to the laser diode component. Highly alignment sensitive components are mounted inside the protective cap. Avoid clamping the laser diode along the axis of the beam. Suggested mounting is clamping about the radius of the diode or bonding the diode to a thermally conductive material.

Mode Hop: To minimize mode hops in single-frequency lasers, it is crucial to control environmental conditions and eliminate optical feedback as these factors can induce mode hops, a sudden change in power and wavelength. However, even with these precautions, mode hops may still occur, especially as the diode ages and its characteristics change over time. Suitable solutions are dependent on application and may involve calibration routines or integration of appropriate sensors.

RoHS compliant