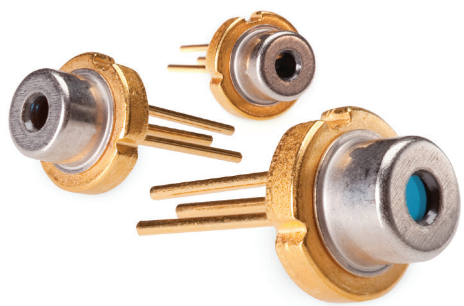
SureLock™

TO-can Stabilized Laser Diodes

Coherent'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 Coherent 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 <300MHz 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
- Bioinstrumentation
- Particle Counting
- Sensing and Environmental Monitoring
- Interferometry
- Holography
- Analytical Instrumentation
- Precision Manufacturing

COHERENT

Specifications[1]	TO-640 nm 20 mW	TO-638 nm 32 mW	TO-640 nm 32 mW	TO-658 nm 40 mW	TO-660 nm 40 mW
SKU	115-81045-003	115-81045-012	115-81045-013	115-ER328-025	115-ER328-023
Spatial Mode	Single Mode	Single Mode	Single Mode	Single Mode	Single Mode
Output Power (mW) Maximum	 20	 32	 32	 40	 40
Center Wavelength[2] (nm) Minimum Typical Maximum	 639 640 641	 637 638 639	 639 640 641	 657 658 659	 659 660 661
Typical Linewidth (MHz)	300	300	300	300	300
Central Stabilized Temperature (°C) Minimum Maximum	 15 45	 15 45	 15 45	 15 40	 15 40
Stabilized Temperature Range (°C) Minimum Typical	 10 14	 10 14	 10 14	 10 15	 10 15
Threshold Current (mA) Typical Maximum	 45 60	 45 60	 45 60	 55 70	 55 70
Operating Current (mA) Typical Maximum	 70 100	 80 105	 80 105	 100 135	 100 135
Operating Voltage (V) Typical Maximum	 2.4 2.6	 2.4 2.6	 2.4 2.6	 2.5 2.8	 2.5 2.8
Photodiode Reverse Voltage (max)	30	30	30	-	-
Laser Reverse Voltage (max)	2	2	2	-	-
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	 0.05 0.3 0.6	 0.05 0.3 0.6
Beam Divergence, Perpendicular (°) Minimum Typical Maximum	 16 21 24	 16 21 24	 16 21 24	 - 14 -	 - 14 -
Beam Divergence, Parallel (°) Minimum Typical Maximum	 7 10 13	 7 10 13	 7 10 13	 - 10 -	 - 10 -
Off Axis Angle, Perpendicular (°) Minimum Typical Maximum	 - - -	 - - -	 - - -	 - - -	 - - -
Off Axis Angle, Parallel (°) Minimum Typical Maximum	 - - -	 - - -	 - - -	 - - -	 - - -

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

Specifications[1]	TO-640 nm 20 mW	TO-638 nm 32 mW	TO-640 nm 32 mW	TO-658 nm 40 mW	TO-660 4nm 0 mW
Emitter Size (micron)	-	-	-	-	-
Differential Efficiency (mW/mA)	1	1	1	1.1	1.1
Polarization, Typical	60:1	60:1	60:1	100:1	100:1
Polarization Orientation	TM	TM	TM	TE	TE
Pin out (Pin 1, Pin 2, Pin 3)	PC, PA-LC, LA	PC, PA-LC, LA	PC, PA-LC, LA	PA, PC-LA, LC	PA, PC-LA, LC
Astigmatism (mm)	-	-	-	-	-
Linewidth Units	MHz	MHz	MHz	MHz	MHz
Operating Requirements					
Operating Temperature[3] (°C) Minimum Maximum	 0 50	 0 50	 0 50	 0 50	 0 50
Storage Temperature[3] (°C) Minimum Maximum	 -10 60	 -10 60	 -10 60	 -10 60	 -10 60

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Specifications[1]	TO-687 45 mW	TO-690 45 mW	TO-785 80 mW	TO-785 100 mW
SKU	115-81041-009	115-81039-016	115-ER255-008	115-ER255-006
Spatial Mode	Single Mode	Single Mode	Single Mode	Single Mode
Output Power (mW)				
Maximum	45	45	80	100
Center Wavelength[2] (nm)				
Minimum	686	689	784.5	784.5
Typical	687	690	785	785
Maximum	688	691	785.5	785.5
Typical Linewidth (MHz)	300	100	300	300
Central Stabilized Temperature (°C)				
Minimum	15	15	15	15
Maximum	40	40	40	40
Stabilized Temperature Range (°C)				
Minimum	10	10	10	10
Typical	15	15	15	15
Threshold Current (mA)				
Typical	35	30	35	35
Maximum	60	60	55	55
Operating Current (mA)				
Typical	75	75	105	125
Maximum	140	120	160	160
Operating Voltage (V)				
Minimum	2	-	-	-
Typical	2.7	2.3	2.3	2.3
Maximum	3	3	-	-
Photodiode Reverse Voltage (max)	30	30	-	-
Laser Reverse Voltage (max)	2	2	2	2
Monitoring Output Current (mA)				
Minimum	0.05	0.08	0.1	0.1
Typical	0.3	0.15	0.5	0.5
Maximum	2.5	0.35	0.7	0.7
Beam Divergence, Perpendicular (°)				
Minimum	16	18	15	15
Typical	20	21	17	17
Maximum	25	25	19	19
Beam Divergence, Parallel (°)				
Minimum	8	7	8	8
Typical	10.5	9	9	9
Maximum	14	12	10	10
Off Axis Angle, Perpendicular (°)				
Minimum	-2.5	-	-2	-2
Typical	-	-	-	-
Maximum	2.5	-	2	2
Off Axis Angle, Parallel (°)				
Minimum	-2	-	-2	-2
Typical	-	-	-	-
Maximum	2	-	2	2

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Specifications[1]	TO-687 45 mW	TO-690 45 mW	TO-785 80 mW	TO-785 100 mW
Emitter Size (micron)	-	2x3	0.9x2.1	0.9x2.1
Differential Efficiency (mW/mA)	0.9	1.1	1.1	1.1
Polarization, Typical	100:1	-	-	-
Polarization Orientation	TE	TE	TE	TE
Pin out (Pin 1, Pin 2, Pin 3)	PA, PC-LA, LC	PC, PA-LC, LA	PC, PA-LC, LA	PC, PA-LC, LA
Astigmatism (mm)	8	1	-	-
Linewidth Units	MHz	MHz	MHz	MHz
Operating Requirements				
Operating Temperature[3] (°C) Minimum Maximum	 0 50	 0 50	 0 50	 0 50
Storage Temperature[3] (°C) Minimum Maximum	 -10 60	 -10 60	 -10 60	 -10 60

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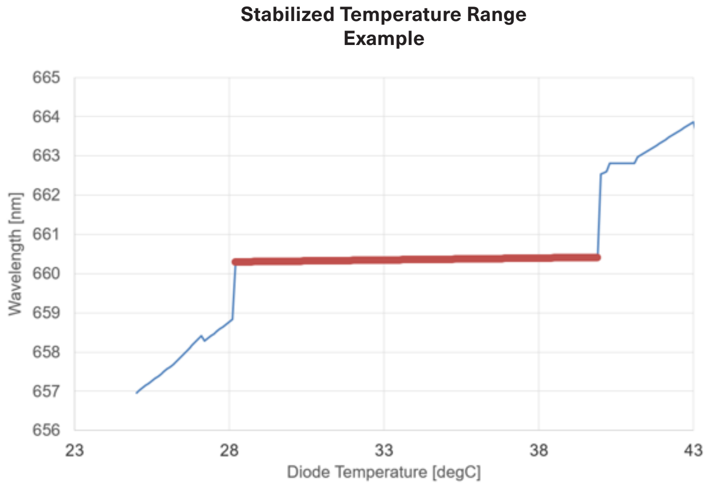
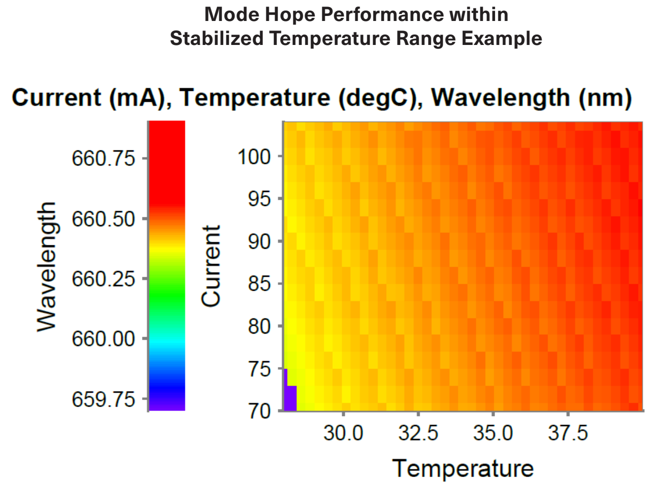
Typical Performance Data

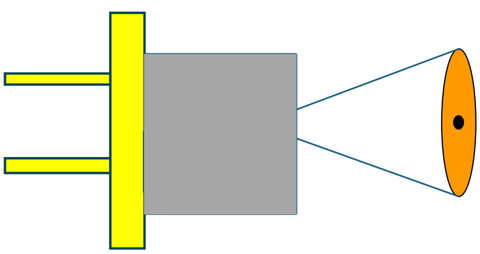




Beam Profile of a Wavelength Stabilized Diode

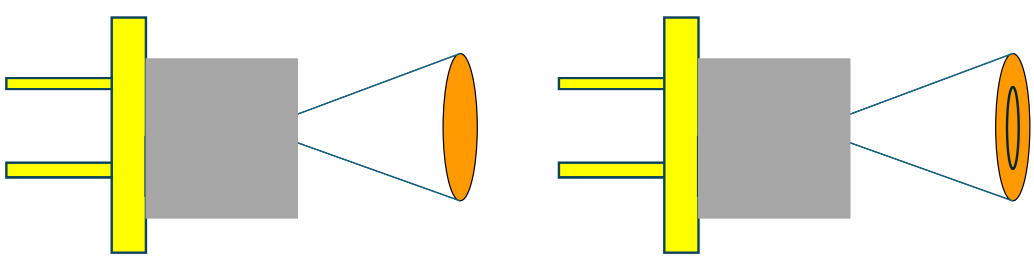
The compact design of TO-can volume-holographic-grating (VHG) stabilized diodes results in an artifact in the spatial beam profile. The VHG selectively diffracts light from the central light cone emitted by the diode to provide the wavelength-stabilizing optical feedback. The presence of a round region 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



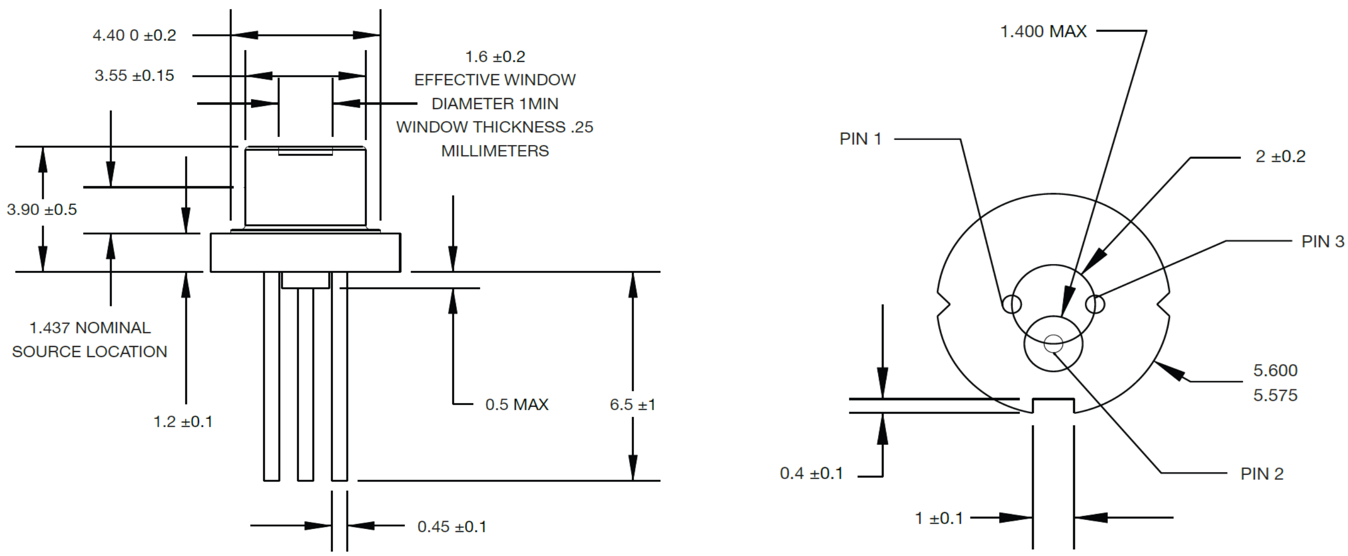
When the wavelength is not stabilized, the central region brightens up or might develop a ring structure.

Unstabilized beam profile

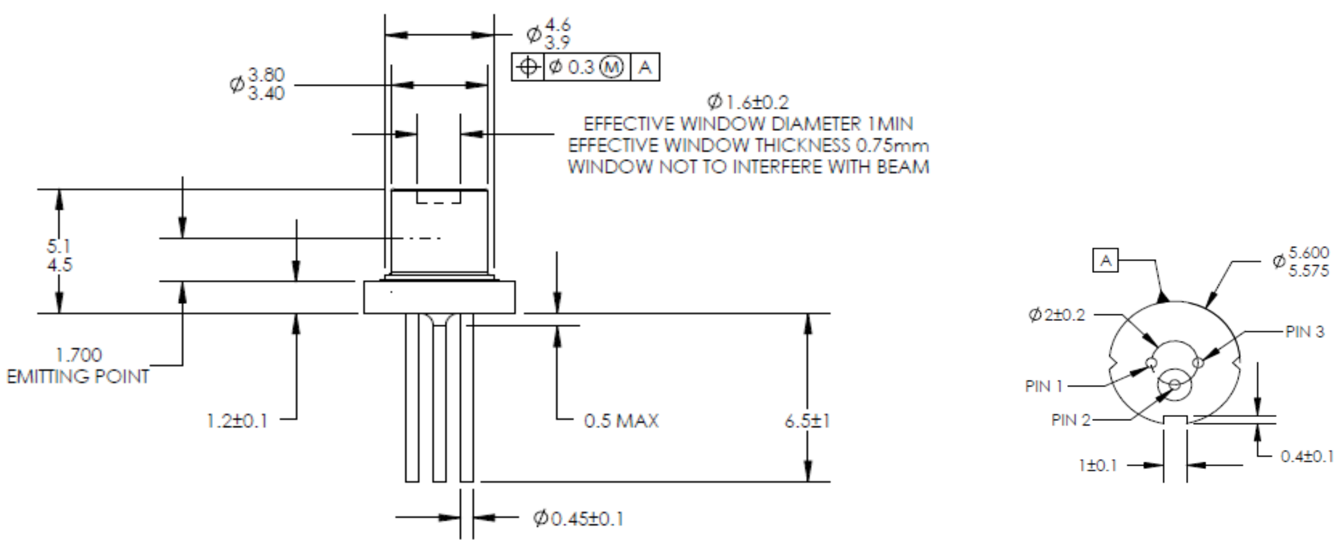


Mechanical Specifications

Size A

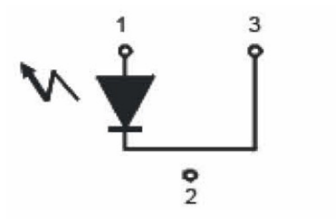


Size B

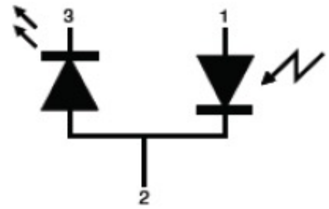


Pinout

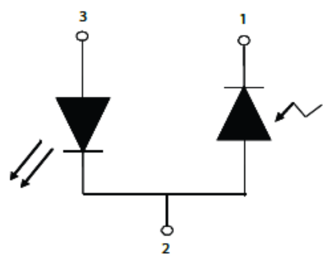
-001 : LA,-,LC



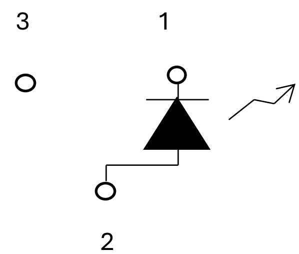
-002 : PA,PC-LA,LC



-003 : PC,PA-LC,LA



-004 : -,LA,LC



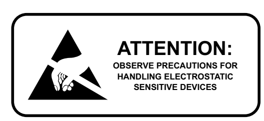
Warnings

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.

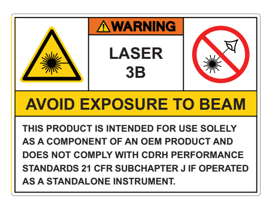
During optical alignments near normal incidence, use an optical isolator or optical density (OD) filter to eliminate the risk of brief high-intensity optical feedback. Be cautious with wavelength-sensitive elements such as narrow bandpass filters. Angularly sweeping the alignment of such elements can 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.