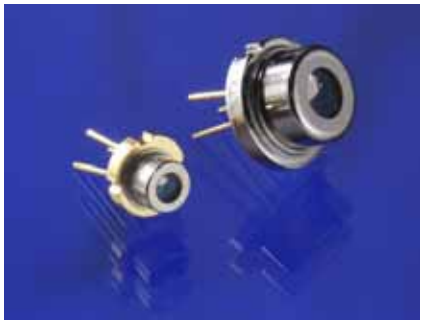
Diode Lasers, Single-mode 50 to 200 mW, 810/830/852 nm

54xx Series



Key Features

- **200 mW kink-free power**
- **Narrow spectral width**
- **High efficiency**
- **Low astigmatism**
- **High reliability**

Applications

- Illumination
- Printing
- Sensing
- Medical applications
- Imaging

High-resolution applications including optical data storage, image recording, spectral analysis, printing, point-to-point free-space communications and frequency doubling all require diffraction-limited sources. Faster writing, wider dynamic range and better signal-to-noise ratio may be achieved with JDSU's high-reliability 5400 Series single-mode diode lasers.

Available in power levels up to 200 mW kink-free, this advanced diode laser combines a quantum well structure and a real-refractive index-guided single-mode waveguide to provide high power, low astigmatism, narrow spectral width and a single spatial mode Gaussian far field. Our 5400 Series diode lasers are among the most reliable high-power diode lasers available in the industry today.

The 5400 Series diode lasers operate in single longitudinal mode under some conditions. Like in all Fabry-Perot index-guided diode lasers, spectral broadening, mode hopping and longitudinal mode instability may occur due to small changes in drive current, diode-junction temperature or optical feedback.

The unique diode structure features high reliability with long operating life and very low early failure rate. The highest brightness (20 MW/cm^2 steradian) is provided by our 5430.

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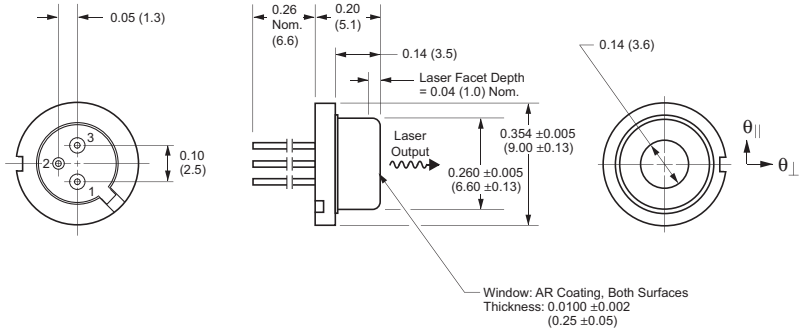
Dimensions Diagrams

(Specifications in inches [mm] unless otherwise noted.)
Standard Tolerances
inches: x.xx = ±0.02 mm: x.x = ±0.5
x.xxx = ±0.010 x.xx = ±0.25

Package Style: SOT-148 Window (G1)

Pinout

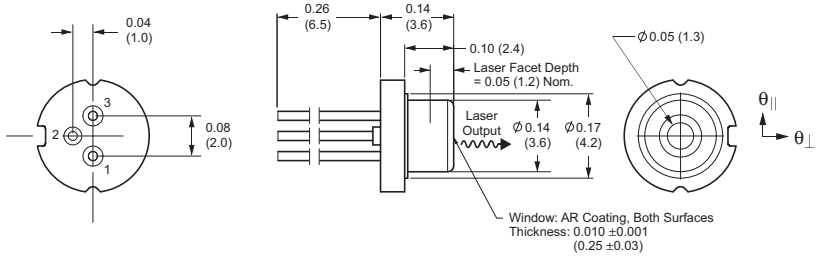
Pin	Description
1	Laser cathode (–)
2	Laser anode, MPD cathode and case ground
3	Monitor photodiode anode (+)



Package Style: TO-56 Window (J1)

Pinout

Pin	Description
1	Laser cathode (–)
2	Laser anode, MPD cathode and case ground
3	Monitor photodiode anode (+)



Available Configurations

5400 Series	5410 Series	5420 Series	5430 Series
5401-G1	5411-G1	5421-G1	5431-G1
5401-J1	5411-J1	5421-J1	5431-J1

Electro-optical Specifications

Parameter	Symbol	5400 Series			5410 Series			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
Laser Characteristics								
CW output power, kink-free[2]	P_O	–	–	50	–	–	100	mW
Center wavelength	λ_C	–	(note[5])	–	–	(note[5])	–	
Spectral width[1]	$\Delta\lambda$	–	3	5	–	3	5	nm
Slope efficiency	$\eta D = P_O/(I_{op}–I_{th})$	0.75	0.85	–	0.75	0.85	–	mW/mA
Conversion efficiency	$\eta = P_O/(I_{op}V_{op})$	–	30	–	–	30	–	%
Emitting dimensions	W x H	–	3 x 1	–	–	3 x 1	–	µm
FWHM beam divergence								
Parallel to junction	$\theta_{//}$	–	9	–	–	9	–	degrees
Perpendicular to junction	$\theta_{\perp}$	–	30	–	–	30	–	degrees
Threshold current	I_{th}	–	35	45	–	35	45	mA
Operating current	I_{op}	–	95	105	–	160	170	mA
Operating voltage	V_{op}	–	(note[4])	–	–	(note[4])	–	
Series resistance	R_S	–	4.0	6.0	–	4.0	6.0	Ω
Thermal resistance	R_{th}	–	60	–	–	60	–	°C/W
Recommended case temperature	T_C	-20	–	30	-20	–	30	°C
Absolute Maximum Ratings								
Reverse voltage	V_{rl}	–	–	3	–	–	3	V
Case operating temperature	T_{op}	-20	–	50	-20	–	50	°C
Storage temperature range	T_{stg}	-40	–	80	-40	–	80	°C
Lead soldering temperature	T_{is}	–	–	250	–	–	250	°C (5 sec.)
Monitor Photodiode								
Sensitivity								
G1 package	–	0.1	–	20	0.1	–	20	µA/mW
J1 package	–	3.0	–	24	3.0	–	24	µA/mW
Capacitance	–	–	6	–	–	6	–	pF
Breakdown voltage	V_{bd}	–	25	–	–	25	–	V
Operating voltage	V_{op}	–	10	–	–	10	–	V

1. Emission bandwidth for 90% integrated power.
2. Typical values at 25°C and 0.6 NA collection optics.
3. Features common to all 5400 series diode lasers include:
   a. Duty factor of 100%.
   b. Temperature coefficient of wavelength is approximately 0.3 nm/°C.
   c. Temperature coefficient of threshold current can be modeled as:
   $I_{TH2} = I_{TH1} \exp [(T_2 – T_1)/T_0]$ where T_0 is a device constant of about 110°K.
   d. Temperature coefficient of operating current is approximately 0.5 to 0.7% per °C.
4. Forward voltage is typically: $V_f = 1.5\ V + I_{op} \times R_s$.
5. Wavelength ranges for the 5400 and 5410 series:
   800 – 820 nm
   810 – 850 nm
   842 – 862 nm
   A variety of part numbers are available that each designate a particular subset within these wavelength ranges. Consult tables on page 5.
6. Astigmatism is less than 5 µm.

Electro-optical Specifications

Continued

Parameter	Symbol	5420 Series			5430 Series			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
Laser Characteristics								
CW output power, kink-free[2]	P_O	–	–	150	–	–	200	mW
Center wavelength	λ_C	–	(note[5])	–	–	(note[5])	–	
Spectral width[1]	$\Delta\lambda$	–	3	5	–	3	5	nm
Slope efficiency	$\eta D = P_O/(I_{op}–I_{th})$	0.75	0.85	–	0.75	0.85	–	mW/mA
Conversion efficiency	$\eta = P_O/(I_{op}V_{op})$	–	30	–	–	30	–	%
Emitting dimensions	W x H	–	3 x 1	–	–	3 x 1	–	µm
FWHM beam divergence								
Parallel to junction	$\theta_{//}$	–	9	–	–	9	–	degrees
Perpendicular to junction	$\theta_{\perp}$	–	30	–	–	30	–	degrees
Threshold current	I_{th}	–	35	45	–	40	50	mA
Operating current	I_{op}	–	210	230	–	270	300	mA
Operating voltage	V_{op}	–	(note[4])	–	–	(note[4])	–	
Series resistance	R_S	–	4.0	6.0	–	4.0	6.0	Ω
Thermal resistance	R_{th}	–	60	–	–	60	–	°C/W
Recommended case temperature	T_C	-20	–	30	-20	–	30	°C
Absolute Maximum Ratings								
Reverse voltage	V_{rl}	–	–	3	–	–	3	V
Case operating temperature	T_{op}	-20	–	50	-20	–	50	°C
Storage temperature range	T_{stg}	-40	–	80	-40	–	80	°C
Lead soldering temperature	T_{is}	–	–	250	–	–	250	°C (5 sec.)
Monitor Photodiode								
Sensitivity	–	0.1	–	20	0.1	–	20	µA/mW
Capacitance	–	–	6	–	–	6	–	pF
Breakdown voltage	V_{bd}	–	25	–	–	25	–	V
Operating voltage	V_{op}	–	10	–	–	10	–	V

1. Emission bandwidth for 90% integrated power.
2. Typical values at 25°C and 0.6 NA collection optics.
3. Features common to all 5400 series diode lasers include:
   a. Duty factor of 100%.
   b. Temperature coefficient of wavelength is approximately 0.3 nm/°C.
   c. Temperature coefficient of threshold current can be modeled as:
   $I_{TH2} = I_{TH1} \exp [(T_2 – T_1)/T_0]$ where T_0 is a device constant of about 110°K.
   d. Temperature coefficient of operating current is approximately 0.5 to 0.7% per °C.
4. Forward voltage is typically: $V_f = 1.5\ V + I_{op} \times R_s$.
5. Wavelength ranges for the 5420 series:
   800 – 820 nm
   810 – 850 nm
   842 – 862 nm
   Wavelength range for the 5430 series is limited to 820 – 840 nm.
   A variety of part numbers are available that each designate a particular subset within these wavelength ranges. Consult tables on page 5.
6. Astigmatism is less than 5 µm.

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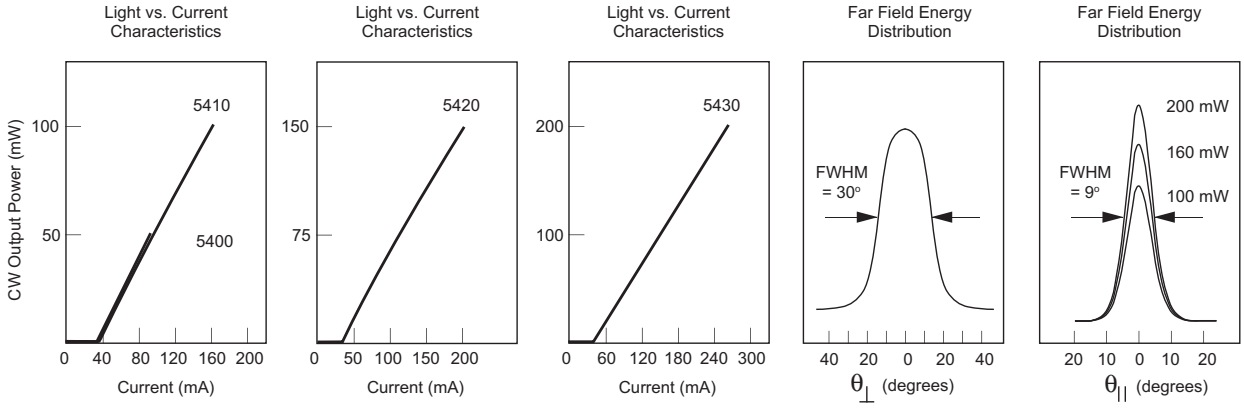
Typical Optical Characteristics



Ordering Information

For more information on this or other products and their availability, please contact your local JDSU account manager or JDSU directly at 1-800-498-JDSU (5378) in North America and +800-5378-JDSU worldwide, or via e-mail at customer.service@jdsu.com.

Sample: 54-00202

Part Number	Power	Wavelength	Package
54-00202	50 mW	810 (±5)	5.6 mm TO-56
54-00203	50 mW	830 (-10/+20)	5.6 mm TO-56
54-00141	50 mW	830 (-10/+20)	9 mm SOT-148
54-00204	50 mW	852 (±10)	5.6 mm TO-56
54-00205	100 mW	810 (±5)	5.6 mm TO-56
54-00206	100 mW	830 (-10/+20)	5.6 mm TO-56
54-00207	100 mW	852 (±10)	5.6 mm TO-56
54-00179	100 mW	830 (±20)	9 mm SOT-148
54-00210	150 mW	810 (±5)	5.6 mm TO-56
54-00060	150 mW	830 (±10)	9 mm SOT-148
54-00211	150 mW	830 (±10)	5.6 mm TO-56
54-00062	150 mW	852 (±4)	9 mm SOT-148
54-00212	150 mW	852 (±10)	5.6 mm TO-56
54-00072	200 mW	830 (±10)	9 mm SOT-148
54-00213	200 mW	830 (±10)	5.6 mm TO-56
54-00214	200 mW	852 (±10)	5.6 mm TO-56
54-00253	200 mW	830 (±10)	9 mm SOT-148

User Safety

Safety and Operating Considerations

The laser light emitted from this diode laser is invisible and may be harmful to the human eye. Avoid looking directly into the diode laser or into the collimated beam along its optical axis when the device is in operation.

CAUTION: THE USE OF OPTICAL INSTRUMENTS WITH THIS PRODUCT WILL INCREASE EYE HAZARD.

Operating the diode laser outside of its maximum ratings may cause device failure or a safety hazard. Power supplies used with the component must be employed such that the maximum peak optical power cannot be exceeded. CW diode lasers may be damaged by excessive drive current or switching transients. When using power supplies, the diode laser should be connected with the main power on and the output voltage at zero. The current should be increased slowly while monitoring the diode laser output power and the drive current.

Device degradation accelerates with increased temperature, and therefore careful attention to minimize the case temperature is advised. For example, life expectancy will decrease by a factor of four if the case is operated at 50°C rather than 30°C.

A proper heatsink for the diode laser on a thermal radiator will greatly enhance laser life. Firmly mount the laser on a radiator with a thermal impedance of less than 2°C/W for increased reliability.

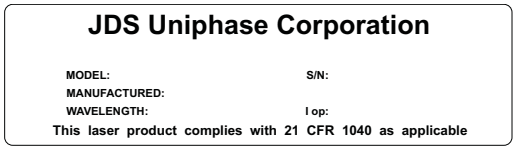
ESD PROTECTION – Electrostatic discharge is the primary cause of unexpected diode laser failure. Take extreme precaution to prevent ESD. Use wrist straps, grounded work surfaces and rigorous antistatic techniques when handling diode lasers.

Labeling

21 CFR 1040.10 Compliance

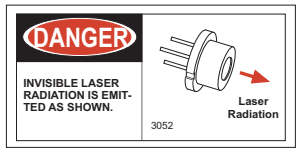
Because of the small size of these devices, each of the labels shown is attached to the individual shipping container. They are illustrated here to comply with 21 CFR 1040.10 as applicable under the Radiation Control for Health and Safety Act of 1968.

Serial Number Identification Label



Output Power Danger Label

Package Aperture Labels



G1, J1 Package Diodes