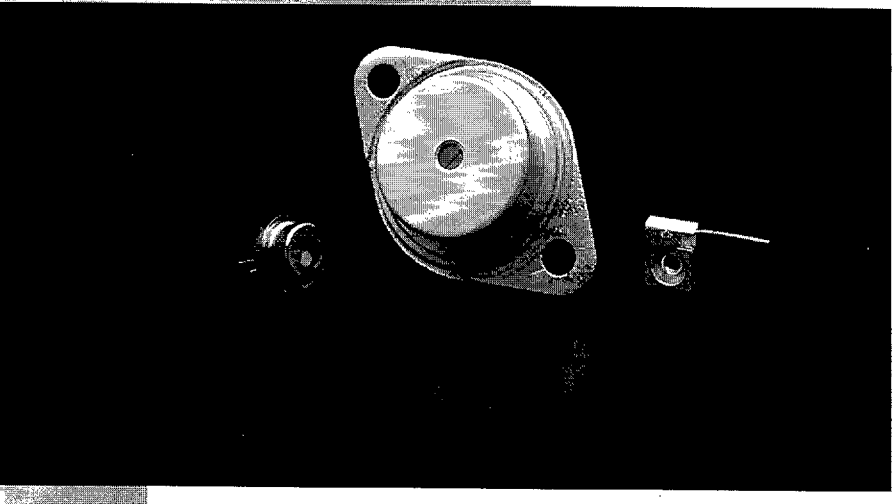
SDL 5400 SERIES



UP TO 200 mW CW SINGLE MODE GaAlAs LASER DIODES

Key Features

Diffraction Limited Beam

TEM_{00} Single Transverse Mode

50, 100, 150, 200 mW cw Power

1 x 3 µm Source Size

High Reliability

High power in a diffraction limited, single spatial mode beam is provided by the SDL-5400 Series laser diode. The index guided laser emits in a single spatial mode to 200 mW cw.

High resolution applications including optical data storage, image recording, spectral analysis, printing, point-to-point communication, and frequency doubling require diffraction limited sources. Faster writing, wider dynamic range and better signal-to-noise ratio may be achieved with the high power SDL-5430.

This advanced laser diode combines a quantum well structure and a real-refractive-index single lasing waveguide to provide high power, low astigmatism, narrow spectral width and a gaussian far field. The SDL-5400 Series is capable of cw operation or modulation rates greater than 1 GHz. Low astigmatism, low divergence and 1 x 3 µm emitter dimensions allow high energy concentration into diffraction limited spots.

The SDL-5400 Series laser diode operates in single longitudinal mode under some conditions. Like all Fabry-Perot index guided laser diodes, spectral broadening, mode hopping and longitudinal mode instability may occur due to small changes in drive current, diode junction temperature or optical feedback. Applications which require stable single longitudinal mode performance are optimized with a Distributed Bragg Reflector (DBR) laser diode source. (See SDL-5700/6700 Series product information.)

The unique diode structure features high reliability with long operating life and very low early failure rate. Very high brightness (40 MW/cm^2 steradian) is provided by the SDL-5430.

Useful packaging options include open heatsink, SOT or TO-3 packages, internal photodiode, thermoelectric cooler and wavelength selection.

SDL®

Specifications

(Typical values at 25 °C and 0.6 NA collection optics)

Model Number	CW Output Power (mW)	Differential Quantum Efficiency (mW/mA)	Total Conversion Efficiency (%)	Emitting Dimensions W x H (µm)	Beam Divergence $\theta_\perp$, $\theta_{\parallel}$ (deg FWHM)	Threshold Current (mA)	Operating Current (mA)
SDL-5430-C	200	0.75 (50%)	30	3.0 x 1.0	30, 9	40	300
SDL-5430-G1	200	0.75 (50%)	30	3.0 x 1.0	30, 9	40	300
SDL-5431-G1	200	0.75 (50%)	30	3.0 x 1.0	30, 9	40	300
SDL-5432-H1	200	0.75 (50%)	30	3.0 x 1.0	30, 9	40	300
SDL-5420-C	150	0.75 (50%)	30	3.0 x 1.0	30, 9	35	230
SDL-5420-G1	150	0.75 (50%)	30	3.0 x 1.0	30, 9	35	230
SDL-5421-G1	150	0.75 (50%)	30	3.0 x 1.0	30, 9	35	230
SDL-5422-H1	150	0.75 (50%)	30	3.0 x 1.0	30, 9	35	230
SDL-5410-C	100	0.75 (50%)	30	3.0 x 1.0	30, 9	35	170
SDL-5410-G1	100	0.75 (50%)	30	3.0 x 1.0	30, 9	35	170
SDL-5411-G1	100	0.75 (50%)	30	3.0 x 1.0	30, 9	35	170
SDL-5412-H1	100	0.75 (50%)	30	3.0 x 1.0	30, 9	35	170
SDL-5400-C	50	0.75 (50%)	30	3.0 x 1.0	30, 9	35	100
SDL-5400-G1	50	0.75 (50%)	30	3.0 x 1.0	30, 9	35	100
SDL-5401-G1	50	0.75 (50%)	30	3.0 x 1.0	30, 9	35	100
SDL-5402-H1	50	0.75 (50%)	30	3.0 x 1.0	30, 9	35	100

Notes

1. Features common to all SDL-5400 Series laser diodes 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.

2. Modulation bandwidth of cw laser diodes is approximately 1 GHz for "C" package diodes. "G" and "H" package diodes roll-off at slightly lower frequencies due to inductance of pins and internal leads.

3. Forward Voltage is typically: $V_f = 1.5\ V + I_{op} \times R_s$

4. Wavelength ranges for the SDL-5400 Series are as follows:
   SDL-5400 780-815, 830-840, 850-860 nm
   SDL-5410 800-815, 830-840, 850-860 nm
   SDL-5420 810-815, 830-840, 850-860 nm
   SDL-5430 830 ±10 nm, 860 ±10 nm
   Refer to Price List for wavelength selection, range, variance and options.

5. Astigmatism is less than 5 µm.

6. **Monitor Photodiode**

Sensitivity:	0.1 to 20 µA/mW
Capacitance:	6 pf
Breakdown Voltage:	25 V
Operating Voltage:	10 V

7. **Thermoelectric Cooler** (available on "H1" pkg. only)

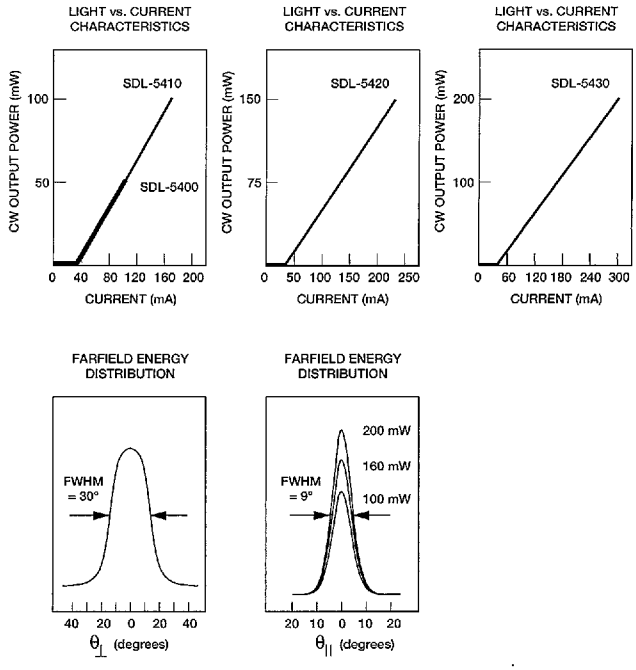
Maximum Drive Current:	2.0 A
Maximum Drive Voltage:	4.0 V
Thermal Resistance:	15 °C/W
Thermistor R @ 25 °C:	10 kΩ

8. Definition of Part Numbers:

SDL-54X X - (C, G1, or H1 package)
- 0 - No Options
- 1 - Monitor Photodiode
- 2 - Monitor Photodiode, TE Cooler

- 0 - 50 mW cw
- 1 - 100 mW cw
- 2 - 150 mW cw
- 3 - 200 mW cw

Optical Characteristics



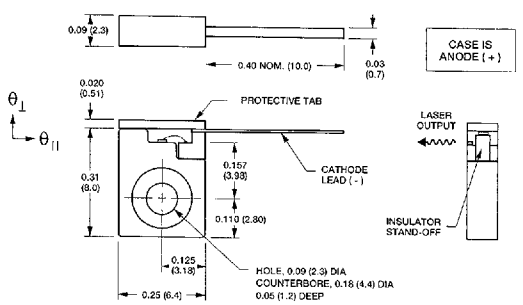
Absolute Maximum Ratings

Series Resistance (Ω)	Thermal Resistance (°C/W)	Recommended Case Temperature (°C)	CW Output Power (mW)	Reverse Voltage (volts)	Case Operating Temperature (°C)	Storage Temperature Range (°C)	Lead Soldering Temperature (°C for 5 sec)
4.0	60	-20 to 30	220	3	-20 to 50	-55 to 80	250
4.0	60	-20 to 30	220	3	-20 to 50	-55 to 80	250
4.0	60	-20 to 30	220	3	-20 to 50	-55 to 80	250
4.0	NA	-20 to 30	220	3	-20 to 50	-55 to 80	250
4.0	60	-20 to 30	160	3	-20 to 50	-55 to 80	250
4.0	60	-20 to 30	160	3	-20 to 50	-55 to 80	250
4.0	60	-20 to 30	160	3	-20 to 50	-55 to 80	250
4.0	NA	-20 to 30	160	3	-20 to 50	-55 to 80	250
4.0	60	-20 to 30	105	3	-20 to 50	-55 to 80	250
4.0	60	-20 to 30	105	3	-20 to 50	-55 to 80	250
4.0	60	-20 to 30	105	3	-20 to 50	-55 to 80	250
4.0	NA	-20 to 30	105	3	-20 to 50	-55 to 80	250
4.0	60	-20 to 30	55	3	-20 to 50	-55 to 80	250
4.0	60	-20 to 30	55	3	-20 to 50	-55 to 80	250
4.0	60	-20 to 30	55	3	-20 to 50	-55 to 80	250
4.0	NA	-20 to 30	55	3	-20 to 50	-55 to 80	250

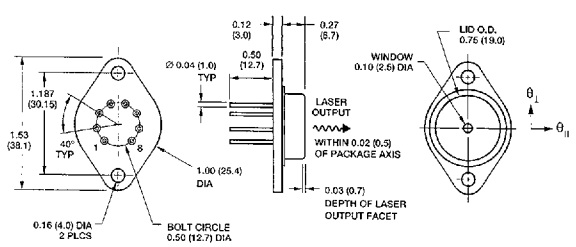
Package Specifications [Dimensions in inches (mm) except where indicated]

SDL Standard Tolerances: (unless otherwise specified) **inches:** x.xx = ±0.02, x.xxx = ±0.010 **mm:** x.x = ±0.5, x.xx = ±0.25

C OPEN HEATSINK PACKAGE

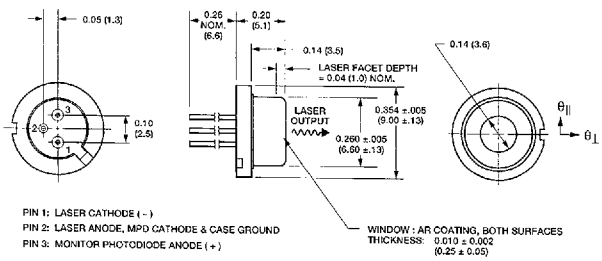


H1 TO-3 WINDOW PACKAGE



Pin 1: TEC (+)
Pin 2: Thermistor (1)
Pin 3: Thermistor (2)
Pin 4: Laser Cathode (-)
Pin 5: Laser Anode (+), Case
Pin 6: Monitor Photodiode Anode
Pin 7: Monitor Photodiode Cathode
Pin 8: TEC (-)

G1 SOT-148 WINDOW PACKAGE



PIN 1: LASER CATHODE (-)
PIN 2: LASER ANODE, MPD CATHODE & CASE GROUND
PIN 3: MONITOR PHOTODIODE ANODE (+)

SDL-5400 SERIES

Safety And Operating Considerations

The laser light emitted from this laser diode is invisible and may be harmful to the human eye. Avoid looking directly into the laser diode, 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 laser diode 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 laser diodes may be damaged by excessive drive current or switching transients. When using power supplies, the laser diode should be connected with the main power on and the output voltage at zero. The current should be increased slowly while monitoring the laser diode 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 heat sink for the laser diode on a thermal radiator will greatly enhance laser life. Firmly mount the laser on a radiator having a thermal impedance of less than 2.0 °C/W for increased reliability.

ESD PROTECTION — Electro-static discharge is the primary cause of unexpected laser diode failure. Take extreme precaution to prevent ESD. Use wrist straps, grounded work surfaces, and rigorous anti-static techniques when handling laser diodes.

This product is export controlled under COCOM. The ECCN is 6A05A: Harmonized Commodity is 8541.40.6050.

21 CFR 1040.10 Compliance

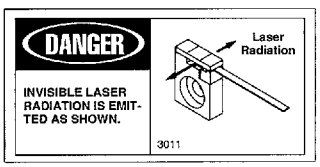
Because of the small size of these devices, each of the labels shown is attached to the individual shipping container. They are illustrated here to comply with 21 CFR 1040.10 as applicable under the radiations control for health and safety act of 1968.

SERIAL NUMBER IDENTIFICATION LABEL

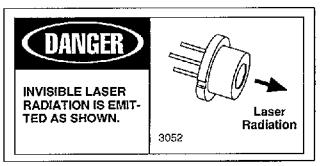
SDL, INC.
SAN JOSE, CALIFORNIA 95134 U.S.A.
MODEL: S/N:
MANUFACTURED:
WAVELENGTH: Iop:
This laser product complies with 21 CFR 1040 as applicable

OUTPUT POWER DANGER LABEL

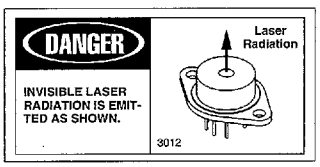
PACKAGE APERTURE LABELS



"C" PACKAGE DIODES



"G1" PACKAGE DIODES



"H1" PACKAGE DIODES