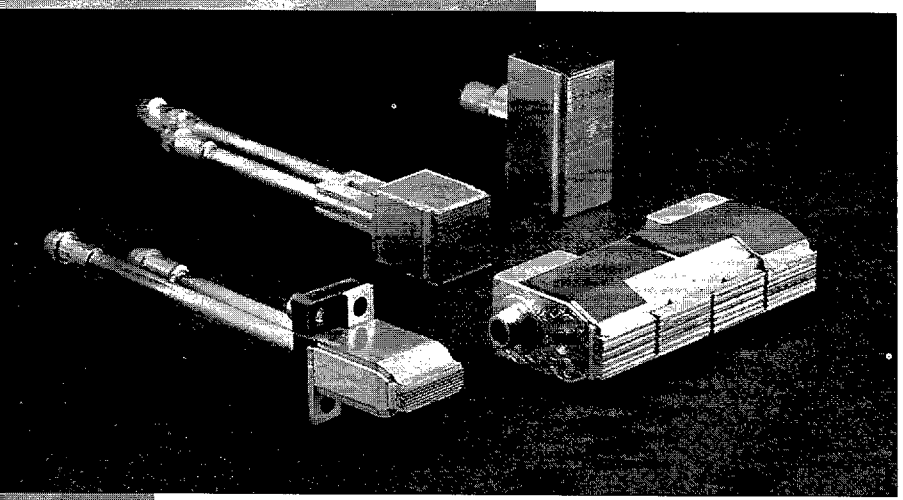
SDL 3200 SERIES



50/60/100 W QCW LINEAR ARRAYS, 100-5000 W QCW STACKED ARRAYS

Key Features

Up to 5 kW Peak Power

Up to 100 W Peak Power per Linear Array

Up to 2000 mJ Energy/Pulse

10 µs - 1 ms Pulse Width

Monolithic Linear or Multi-Layer 2-D Stack

High Efficiency MOCVD Quantum Well Design

20% Duty Factor Versions

Lensed Versions

Ideal as efficient optical pumps for solid state laser rods or slabs, or as high power illuminators, the SDL-3200 Series provides high power density and high peak and average power in a compact, rugged package. The very high efficiency of these GaAlAs laser diode arrays permits high pulse energy at low electrical and thermal loads, increasing lifetime and reliability. Repetition rates are compatible with pulsed solid-state laser system requirements.

Used alone, the monolithic linear arrays provide up to 100 W peak power and 40 mJ per pulse. Two dimensional stacks are readily assembled from tested linear arrays. Low thermal impedance impingement cooled packages allow high average power and high duty factor. Output energy density up to 2.5 kW/cm^2 is available, as is duty factor up to 20%. Conduction cooled packages offer simple temperature control for low duty factor systems.

Quasi-cw devices operate in long pulsewidth mode for optimum energy transfer into solid-state materials with fluorescence lifetime in the 100-1000 µs region. Higher peak power is obtainable from quasi-cw designs than from cw devices, as well as longer pulse width than conventional pulsed diodes.

The SDL-3200 series may also be operated as an illuminator, at short pulse width, high repetition rate and high peak power. Average and peak power limits are the same as for long pulse operation.

Narrow spectral width and low divergence permit efficient coupling into solid-state laser materials. Emission wavelength is temperature tunable (0.3 nm/°C) to match the absorption band of various solid-state laser materials from 785 to 815 nm.

The packages allow for unobstructed positioning of other optical and mechanical components. Integration of multiple linear arrays into a single package minimizes coolant and electrical interfaces and allows maximum stacked array power density.

SDL®

SDL QCW Linear Array Technology

System Design: Choices & Considerations

SDL-3230, SDL-3240 and SDL-3250 quasi-cw linear arrays are tested, burned-in and completely characterized at peak powers of 60 W, 50 W and 100 W respectively. These linear arrays may be stacked in a variety of packages described in this brochure.

The maximum recommended peak power, energy per pulse and average power from a single linear array or from a stack of linear arrays may vary as a function of pulse length, duty factor and nominal stack operating temperature. SDL has completed life testing and operation testing of quasi-cw stacked arrays under a range of duty factor variations, operating temperatures and average power levels.

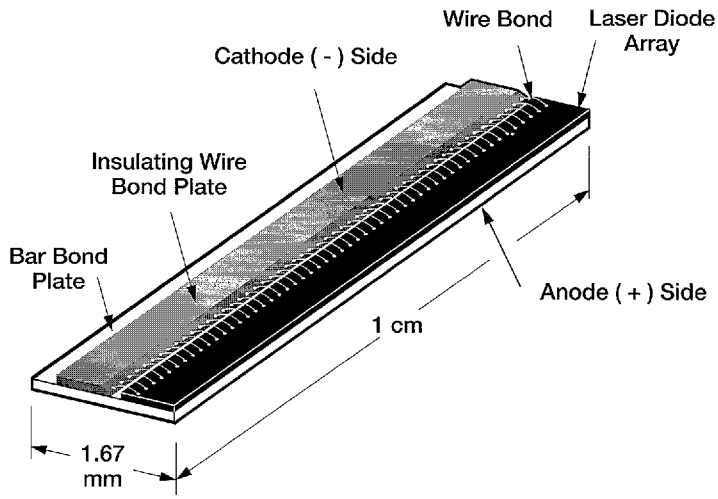
As a result of this extensive testing program, SDL can recommend optimum choices for QCW linear array stacking density, peak power, pulse width or coolant temperature for a wide range of system requirements. In general, at high duty factor, system designers may optimally trade average power for diode lifetime. We strongly recommend that designers of diode pumped solid state laser systems contact SDL directly at an early point in the design process, to become fully aware of optimum operating conditions and possible trade-offs in QCW stack configuration and power.

Laser diode linear array lifetime is generally a function of average junction temperature. Thus, QCW laser diodes operated at low duty factor can usually also be operated at maximum peak power and high stacking density with long relative lifetime. QCW linear arrays operated at high duty factor and/or high coolant temperature can achieve relatively long lifetime if slightly de-rated from maximum peak power values.

As the variations in these parameters can be complex, we recommend direct discussion with SDL marketing or engineering staff during initial system design.

Laser Sub-Assembly (LSA): The Basic Element

Figure 1 The Laser Sub-Assembly (LSA) Basic Structure



All QCW stacked arrays use a single Laser Sub-Assembly (LSA) as the basic element.

The LSA consists of a 1 cm laser diode monolithic linear array with approximately 96% of the emitting edge radiating laser light. The laser diode linear array chip is bonded to an alloy submount with 1 cm length, 1.67 mm width and 0.2 mm thickness. A wire bond plate is soldered to the submount behind the laser diode linear array. Current flows from the (+) contact of the stack through the bar bond plate to the anode (+) side of the diode. It then flows through the diode to the cathode (–) wire bond plate. This in turn is contacted to the next LSA in the stack and the process is repeated through the stack.

Three different diode linear arrays are available on the standard LSA. The SDL-3230 Series is rated for 60 W peak power, while the SDL-3250 Series is rated for 100 W peak power. The high duty factor SDL-3240 Series is rated for 50 W peak power for extended life. The LSA is a complete laser diode device. Extended full power burn-in, characterization, wavelength measurement and life can be fully tested at the LSA assembly level, allowing stacked array assembly from fully qualified LSA sub-assemblies.

A primary application for QCW stacked arrays is diode pumping of solid state lasers. The QCW stacked arrays described in the product data sheet are individually optimized for a variety of solid state laser geometries and operating requirements. Pitch (spacing between linear arrays), maximum peak power per linear array, maximum pulse width, maximum duty factor and package choice are all dependent on system parameters such as aver-

age thermal load, wavelength chirp allowed during the pulse, diode array lifetime expected, system operating temperature and similar requirements.

Specifications described on pages 4-5 and 6-7 are based on stated junction temperature rise and nominal 10^9 pulse lifetime for SDL-3230, 5 x 10^9 pulse life for the SDL-3240, and 10^9 pulse lifetime for the SDL-3250 Series (assuming 200 µs pulse width). Peak power of each linear array should be de-rated in order to; a) optimize lifetime at long pulse widths; b) operate the laser at a higher range of duty factor up to the recommended limit; or c) function at elevated operating temperatures. Appropriate decrease in energy per pulse and average power is implied.

Minimum LSA pitch is 0.4 mm. Applications that require pulse width greater than 400 µs require addition of a copper heat spreader plate bonded to the LSA submount. The copper thickness is selected both for conduction of average thermal load to the array backplane and also for transit time of the thermal wavefront from diode junction to the opposite surface of the LSA. Figure 2 shows LSA assemblies with copper space plates allowing pitch of 0.8, 1.2, 1.6 and 2 mm. Information in this data sheet and available from SDL sales or engineering will assist QCW stack users in selection of LSA peak power and pitch optimized for particular applications.

SDL recommends QCW stack selection to maintain laser diode average junction temperature rise less than 20°C above coldplate or coolant temperature for optimum diode lifetime. Short pulse, low duty factor, small linear array count packages may be simple conduction-cooled devices. As duty factor, pulse width and average thermal energy dissipated increase, maintenance of desired junction temperature rise implies selection of liquid cooled packages (Figure 3). SDL QCW stacks are available in a variety of impingement liquid cooled packages permitting pulse width up to 1 ms, duty factor to 20% and average thermal load up to 200 W.

Figure 3 Typical Conduction and Liquid Cooled Stack Packages

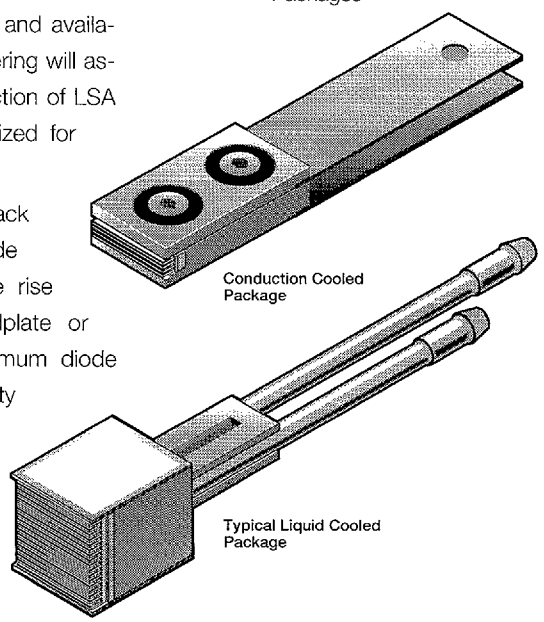
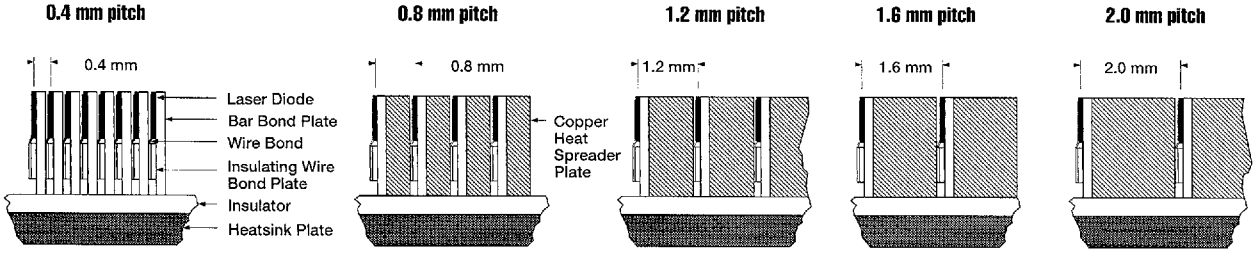


Figure 2 LSA Assemblies Showing Pitch Variations



Specifications

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

Model Number	Quasi-cw Peak Output Power (W)	Energy Per Pulse (mJ)	Maximum Pulse Width (µsec)	Nominal (Tested) Duty Factor (%)	Emitting Dimensions W X H (mm)	Pitch C-C Spacing (mm)	Beam Divergence $\theta_{\perp}$, $\theta_{//}$ (deg FWHM)	Threshold Current (A)	Operating Current (A)
SDL-3251-A1	100	40	400	1.3	10 x 0.001	0.4	30, 10	35	125
SDL-3251-A2	200	80	400	1.3	10 x 0.4	0.4	30, 10	35	125
SDL-3251-A3	300	120	400	1.3	10 x 0.8	0.4	30, 10	35	125
SDL-3251-A4	400	160	400	1.3	10 x 1.2	0.4	30, 10	35	125
SDL-3251-A5	500	200	400	1.3	10 x 1.6	0.4	30, 10	35	125
SDL-3251-A6	600	240	400	1.3	10 x 2.0	0.4	30, 10	35	125
SDL-3251-B1	100	40	400	1.3	10 x 0.001	0.4	30, 10	35	125
SDL-3251-B2	200	80	400	1.3	10 x 0.4	0.4	30, 10	35	125
SDL-3251-B3	300	120	400	1.3	10 x 0.8	0.4	30, 10	35	125
SDL-3251-B4	400	160	400	1.3	10 x 1.2	0.4	30, 10	35	125
SDL-3251-B5	500	200	400	1.3	10 x 1.6	0.4	30, 10	35	125
SDL-3251-B6	600	240	400	1.3	10 x 2.0	0.4	30, 10	35	125
SDL-3255-C1	100	40	400	4.0	10 x 0.001	2.0	30, 10	35	125
SDL-3252-C3	300	120	400	3.0	10 x 1.6	0.8	30, 10	35	125
SDL-3251-C6	600	240	400	2.0	10 x 2.0	0.4	30, 10	35	125
SDL-3252-D6	600	240	400	3.0	10 x 4.0	0.8	30, 10	35	125
SDL-3251-DB	1200	480	400	2.0	10 x 4.4	0.4	30, 10	35	125
SDL-3252-EB	1200	480	400	3.0	10 x 8.8	0.8	30, 10	35	125
SDL-3251-EH	2500	1000	400	2.0	10 x 9.6	0.4	30, 10	35	125
SDL-3254-FB	1200	480	400	4.0	40 x 4.8	1.6	30, 10	35	125
SDL-3253-FD	1600	640	400	4.0	40 x 3.6	1.2	30, 10	35	125
SDL-3251-G1	100	40	400	1.3	10 x 0.001	0.4	30, 10	35	125
SDL-3251-G2	200	80	400	1.3	10 x 0.4	0.4	30, 10	35	125
SDL-3251-G3	300	120	400	1.3	10 x 0.8	0.4	30, 10	35	125
SDL-3251-G4	400	160	400	1.3	10 x 1.2	0.4	30, 10	35	125
SDL-3251-G5	500	200	400	1.3	10 x 1.6	0.4	30, 10	35	125
SDL-3251-G6	600	240	400	1.3	10 x 2.0	0.4	30, 10	35	125
SDL-3251-G7	700	280	400	1.3	10 x 2.4	0.4	30, 10	35	125
SDL-3253-HD	1600	640	400	4.0	10 x 18.0	1.2	30, 10	35	125
SDL-3252-HH	2500	1000	400	4.0	10 x 19.2	0.8	30, 10	35	125
SDL-3251-HK	5000	2000	400	2.0	10 x 19.6	0.4	30, 10	35	125
SDL-3255-J5	400	160	400	4.0	10 x 8.0	2.0	1.5, 10	35	125
SDL-3251-K1	100	40	400	1.3	10 x 0.001	0.4	30, 10	35	125
SDL-3251-K2	200	80	400	1.3	10 x 0.4	0.4	30, 10	35	125
SDL-3251-K3	300	120	400	1.3	10 x 0.8	0.4	30, 10	35	125
SDL-3251-K4	400	160	400	1.3	10 x 1.2	0.4	30, 10	35	125
SDL-3251-K5	500	200	400	1.3	10 x 1.6	0.4	30, 10	35	125
SDL-3251-K6	600	240	400	1.3	10 x 2.0	0.4	30, 10	35	125

Notes

1) Specifications for nominal 10^9 pulse life (assuming 200 µs pulse width).

2) The highest recommended duty factor is shown for each device.

Absolute Maximum Ratings

Operating Voltage (volts)	Series Resistance (Ω)	Thermal Resistance R_{th} (°C/W)	Junction Temp Rise @ Nominal D.F. (°C)	Case Operating Temperature (°C)	Quasi-cw Peak Power (W)	Pulse Width (µs)	Reverse Voltage (volts)	Maximum Duty Factor (%)	Case Operating Temperature (°C)	Storage Temperature Range (°C)
2.1	0.004	1.6	4	-20 to 30	105	400	3	2.6	-25 to 30	-55 to 100
4.0	0.008	1.6	8	-20 to 30	210	400	3	2.2	-25 to 30	-55 to 100
6.0	0.012	1.6	12	-20 to 30	315	400	3	1.9	-25 to 30	-55 to 100
7.9	0.016	1.6	15	-20 to 30	420	400	3	1.7	-25 to 30	-55 to 100
9.8	0.020	1.6	19	-20 to 30	525	400	3	1.6	-25 to 30	-55 to 100
11.7	0.024	1.6	23	-20 to 30	625	400	3	1.5	-25 to 30	-55 to 100
2.1	0.004	1.6	4	-20 to 30	105	400	3	2.9	-25 to 30	-55 to 100
4.0	0.008	1.6	8	-20 to 30	210	400	3	2.6	-25 to 30	-55 to 100
6.0	0.012	1.6	12	-20 to 30	315	400	3	2.3	-25 to 30	-55 to 100
7.9	0.016	1.6	15	-20 to 30	420	400	3	2.1	-25 to 30	-55 to 100
9.8	0.020	1.6	19	-20 to 30	525	400	3	1.9	-25 to 30	-55 to 100
11.7	0.024	1.6	23	-20 to 30	625	400	3	1.7	-25 to 30	-55 to 100
2.1	0.004	0.8	6	-20 to 30	105	400	3	4.0	-25 to 30	-55 to 100
6.0	0.012	0.8	13	-20 to 30	315	400	3	3.0	-25 to 30	-55 to 100
11.7	0.024	0.8	18	-20 to 30	625	400	3	2.0	-25 to 30	-55 to 100
11.7	0.024	0.5	17	-20 to 30	625	400	3	3.0	-25 to 30	-55 to 100
23.5	0.048	0.5	22	-20 to 30	1240	400	3	2.0	-25 to 30	-55 to 100
23.5	0.048	0.25	17	-20 to 30	1240	400	3	3.0	-25 to 30	-55 to 100
48.0	0.064	0.25	23	-20 to 30	2550	400	3	2.0	-25 to 30	-55 to 100
23.5	0.048	0.12	11	-20 to 30	1240	400	3	4.0	-25 to 30	-55 to 100
31.1	0.064	0.12	14	-20 to 30	1640	400	3	4.0	-25 to 30	-55 to 100
2.1	0.004	1.0	2	-20 to 30	105	400	3	2.6	-25 to 30	-55 to 100
4.0	0.008	1.0	5	-20 to 30	210	400	3	2.2	-25 to 30	-55 to 100
6.0	0.012	1.0	7	-20 to 30	315	400	3	1.9	-25 to 30	-55 to 100
7.9	0.016	1.0	10	-20 to 30	420	400	3	1.7	-25 to 30	-55 to 100
9.8	0.020	1.0	12	-20 to 30	525	400	3	1.6	-25 to 30	-55 to 100
11.7	0.024	1.0	15	-20 to 30	625	400	3	1.5	-25 to 30	-55 to 100
13.6	0.028	1.0	17	-20 to 30	725	400	3	1.4	-25 to 30	-55 to 100
31.1	0.064	0.12	14	-20 to 30	1640	400	3	4.0	-25 to 30	-55 to 100
48.0	0.100	0.12	22	-20 to 30	2550	400	3	4.0	-25 to 30	-55 to 100
96.0	0.200	0.12	22	-20 to 30	5060	400	3	2.0	-25 to 30	-55 to 100
9.8	0.020	0.25	7	-20 to 30	420	400	3	4.0	-25 to 30	-55 to 100
2.1	0.004	1.6	4	-20 to 30	105	400	3	2.6	-25 to 30	-55 to 100
4.0	0.008	1.6	8	-20 to 30	210	400	3	2.2	-25 to 30	-55 to 100
6.0	0.012	1.6	12	-20 to 30	315	400	3	1.9	-25 to 30	-55 to 100
7.9	0.016	1.6	15	-20 to 30	420	400	3	1.7	-25 to 30	-55 to 100
9.8	0.020	1.6	19	-20 to 30	525	400	3	1.6	-25 to 30	-55 to 100
11.7	0.024	1.6	23	-20 to 30	625	400	3	1.5	-25 to 30	-55 to 100

Specifications

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

Model Number	Quasi-cw Peak Output Power (W)	Energy Per Pulse (mJ)	Maximum Pulse Width (µsec)	Nominal (Tested) Duty Factor (%)	Emitting Dimensions W X H (mm)	Pitch C-C Spacing (mm)	Beam Divergence $\theta_{\perp}$, $\theta_{//}$ (deg FWHM)	Threshold Current (A)	Operating Current (A)
SDL-3231-A1	60	24	400	2.0	10 x 0.001	0.4	40, 10	20	75
SDL-3231-A2	120	48	400	2.0	10 x 0.4	0.4	40, 10	20	75
SDL-3231-A3	180	72	400	2.0	10 x 0.8	0.4	40, 10	20	75
SDL-3231-A4	240	96	400	2.0	10 x 1.2	0.4	40, 10	20	75
SDL-3231-A5	300	120	400	2.0	10 x 1.6	0.4	40, 10	20	75
SDL-3231-A6	360	144	400	2.0	10 x 2.0	0.4	40, 10	20	75
SDL-3231-B1	60	24	400	2.0	10 x 0.001	0.4	40, 10	20	75
SDL-3231-B2	120	48	400	2.0	10 x 0.4	0.4	40, 10	20	75
SDL-3231-B3	180	72	400	2.0	10 x 0.8	0.4	40, 10	20	75
SDL-3231-B4	240	96	400	2.0	10 x 1.2	0.4	40, 10	20	75
SDL-3231-B5	300	120	400	2.0	10 x 1.6	0.4	40, 10	20	75
SDL-3231-B6	360	144	400	2.0	10 x 2.0	0.4	40, 10	20	75
SDL-3235-C1	60	60	1000	6.0	10 x 0.001	2.0	40, 10	20	75
SDL-3232-C3	180	180	1000	6.0	10 x 1.6	0.8	40, 10	20	75
SDL-3231-C6	360	144	400	4.0	10 x 2.0	0.4	40, 10	20	75
SDL-3232-D6	360	360	1000	6.0	10 x 4.0	0.8	40, 10	20	75
SDL-3231-D8	720	288	400	4.0	10 x 4.4	0.4	40, 10	20	75
SDL-3232-EB	720	720	1000	6.0	10 x 8.8	0.8	40, 10	20	75
SDL-3231-EH	1500	600	400	4.0	10 x 9.6	0.4	40, 10	20	75
SDL-3234-FB	720	720	1000	6.0	40 x 4.8	1.6	40, 10	20	75
SDL-3233-FD	960	960	1000	6.0	40 x 3.6	1.2	40, 10	20	75
SDL-3231-G1	60	24	400	2.0	10 x 0.001	0.4	40, 10	20	75
SDL-3231-G2	120	48	400	2.0	10 x 0.4	0.4	40, 10	20	75
SDL-3231-G3	180	72	400	2.0	10 x 0.8	0.4	40, 10	20	75
SDL-3231-G4	240	96	400	2.0	10 x 1.2	0.4	40, 10	20	75
SDL-3231-G5	300	120	400	2.0	10 x 1.6	0.4	40, 10	20	75
SDL-3231-G6	360	144	400	2.0	10 x 2.0	0.4	40, 10	20	75
SDL-3231-G7	420	168	400	2.0	10 x 2.4	0.4	40, 10	20	75
SDL-3233-HD	960	960	1000	6.0	10 x 18.0	1.2	40, 10	20	75
SDL-3232-HH	1500	1500	1000	6.0	10 x 19.2	0.8	40, 10	20	75
SDL-3231-HK	3000	1200	400	4.0	10 x 19.6	0.4	40, 10	20	75
SDL-3235-J5	240	240	1000	6.0	10 x 8.0	2.0	1.5, 10	20	75
SDL-3231-K1	60	24	400	2.0	10 x 0.001	0.4	40, 10	20	75
SDL-3231-K2	120	48	400	2.0	10 x 0.4	0.4	40, 10	20	75
SDL-3231-K3	180	72	400	2.0	10 x 0.8	0.4	40, 10	20	75
SDL-3231-K4	240	96	400	2.0	10 x 1.2	0.4	40, 10	20	75
SDL-3231-K5	300	120	400	2.0	10 x 1.6	0.4	40, 10	20	75
SDL-3231-K6	360	144	400	2.0	10 x 2.0	0.4	40, 10	20	75

High Duty Factor SDL-3240 SERIES

SDL-3245-C1	50	50	1000	20.0	10 x 0.001	2.0	40, 10	20	75
SDL-3245-F2	100	100	1000	20.0	20 x 0.001	N/A	40, 10	20	75
SDL-3245-F4	200	200	1000	20.0	40 x 0.001	N/A	40, 10	20	75
SDL-3244-FB	600	600	1000	20.0	40 x 4.8	1.6	40, 10	20	75
SDL-3243-FD	800	800	1000	20.0	40 x 3.6	1.2	40, 10	20	75
SDL-3243-HD	800	800	1000	20.0	10 x 18.0	1.2	40, 10	20	75
SDL-3242-HH	1250	1250	1000	8.0	10 x 19.2	0.8	40, 10	20	75
SDL-3245-J5	200	200	1000	20.0	10 x 8.0	2.0	1.5, 10	20	75

Notes

1) Specifications for nominal 10^9 pulse life for SDL-3230 Series and 5 x 10^9 pulse life for SDL-3240 Series (assuming 200 µs pulse width).
2) The highest recommended duty factor is shown for each device. For duty factors ≥ 8%, the peak output power of SDL-3240 Series is 50 W per linear array.

Absolute Maximum Ratings

Operating Voltage (volts)	Series Resistance (Ω)	Thermal Resistance R_{th} (°C/W)	Junction Temp Rise @ Nominal D.F. (°C)	Case Operating Temperature (°C)	Quasi-cw Peak Power (W)	Pulse Width (µs)	Reverse Voltage (volts)	Maximum Duty Factor (%)	Case Operating Temperature (°C)	Storage Temperature Range (°C)
2.1	0.004	1.6	3	-20 to 30	65	400	3	4.4	-25 to 35	-55 to 100
4.0	0.008	1.6	6	-20 to 30	130	400	3	3.8	-25 to 35	-55 to 100
6.0	0.012	1.6	9	-20 to 30	190	400	3	3.2	-25 to 35	-55 to 100
7.9	0.016	1.6	12	-20 to 30	250	400	3	2.8	-25 to 35	-55 to 100
9.8	0.020	1.6	14	-20 to 30	315	400	3	2.6	-25 to 35	-55 to 100
11.7	0.024	1.6	17	-20 to 30	375	400	3	2.4	-25 to 35	-55 to 100
2.1	0.004	1.6	3	-20 to 30	65	400	3	4.8	-25 to 35	-55 to 100
4.0	0.008	1.6	6	-20 to 30	130	400	3	4.3	-25 to 35	-55 to 100
6.0	0.012	1.6	9	-20 to 30	190	400	3	3.8	-25 to 35	-55 to 100
7.9	0.016	1.6	12	-20 to 30	250	400	3	3.5	-25 to 35	-55 to 100
9.8	0.020	1.6	14	-20 to 30	315	400	3	3.2	-25 to 35	-55 to 100
11.7	0.024	1.6	17	-20 to 30	375	400	3	3.0	-25 to 35	-55 to 100
2.1	0.004	0.8	4	-20 to 30	65	1000	3	6.0	-25 to 35	-55 to 100
6.0	0.012	0.8	13	-20 to 30	190	1000	3	6.0	-25 to 35	-55 to 100
11.7	0.024	0.8	17	-20 to 30	375	400	3	4.0	-25 to 35	-55 to 100
11.7	0.024	0.5	16	-20 to 30	375	1000	3	6.0	-25 to 35	-55 to 100
23.5	0.048	0.5	22	-20 to 30	740	400	3	4.0	-25 to 35	-55 to 100
23.5	0.048	0.25	16	-20 to 30	740	1000	3	6.0	-25 to 35	-55 to 100
48.0	0.064	0.25	23	-20 to 30	1550	400	3	4.0	-25 to 35	-55 to 100
23.5	0.048	0.12	8	-20 to 30	740	1000	3	6.0	-25 to 35	-55 to 100
31.1	0.064	0.12	10	-20 to 30	990	1000	3	6.0	-25 to 35	-55 to 100
2.1	0.004	1.0	2	-20 to 30	65	400	3	4.4	-25 to 35	-55 to 100
4.0	0.008	1.0	4	-20 to 30	130	400	3	3.8	-25 to 35	-55 to 100
6.0	0.012	1.0	5	-20 to 30	190	400	3	3.2	-25 to 35	-55 to 100
7.9	0.016	1.0	7	-20 to 30	250	400	3	2.8	-25 to 35	-55 to 100
9.8	0.020	1.0	9	-20 to 30	315	400	3	2.6	-25 to 35	-55 to 100
11.7	0.024	1.0	11	-20 to 30	375	400	3	2.4	-25 to 35	-55 to 100
13.6	0.028	1.0	13	-20 to 30	435	400	3	2.2	-25 to 35	-55 to 100
31.1	0.064	0.12	10	-20 to 30	990	1000	3	6.0	-25 to 35	-55 to 100
48.0	0.100	0.12	16	-20 to 30	1550	1000	3	6.0	-25 to 35	-55 to 100
96.0	0.200	0.12	22	-20 to 30	3250	400	3	4.0	-25 to 35	-55 to 100
9.8	0.020	0.25	5	-20 to 30	250	1000	3	6.0	-25 to 35	-55 to 100
2.1	0.004	1.6	3	-20 to 30	65	400	3	4.4	-25 to 35	-55 to 100
4.0	0.008	1.6	6	-20 to 30	130	400	3	3.8	-25 to 35	-55 to 100
6.0	0.012	1.6	9	-20 to 30	190	400	3	3.2	-25 to 35	-55 to 100
7.9	0.016	1.6	12	-20 to 30	250	400	3	2.8	-25 to 35	-55 to 100
9.8	0.020	1.6	14	-20 to 30	315	400	3	2.6	-25 to 35	-55 to 100
11.7	0.024	1.6	17	-20 to 30	375	400	3	2.4	-25 to 35	-55 to 100
2.1	0.004	0.7	11	-20 to 30	55	1000	3	20.0	-25 to 35	-55 to 100
4.2	0.008	0.2	6	-20 to 30	110	1000	3	20.0	-25 to 35	-55 to 100
8.4	0.016	0.12	7	-20 to 30	220	1000	3	20.0	-25 to 35	-55 to 100
23.5	0.048	0.12	22	-20 to 30	660	1000	3	20.0	-25 to 35	-55 to 100
31.1	0.064	0.12	29	-20 to 30	880	1000	3	20.0	-25 to 35	-55 to 100
31.1	0.064	0.12	29	-20 to 30	880	1000	3	20.0	-25 to 35	-55 to 100
48.0	0.100	0.12	18	-20 to 30	1375	1000	3	8.0	-25 to 35	-55 to 100
9.8	0.020	0.25	15	-20 to 30	220	1000	3	20.0	-25 to 35	-55 to 100

Specifications

Notes

1. Other features include:

   a. Spectral width <4 nm FWHM.
   b. Temperature coefficient of wavelength is approximately 0.27 to 0.3 nm per °C.
   c. Temperature coefficient of threshold current can be modeled as

   $$I_{TH2} = I_{TH1} \exp [(T_2 - T_1)/T_o]$$

   where T_o is a device constant of about 150°K for SDL-3230 diodes and about 130°K for SDL-3250 devices.

   d. Temperature coefficient of operating current is approximately 1% per °C.

   e. Forward Voltage of each linear array is typically:

   $$V_f = 1.5\ V + I_{op} \times 0.004$$

2. Wavelength selection is available as an option. Available wavelength range of SDL-3200 Series quasi-cw array laser diodes is approximately as follows:

SDL-3230 Series	785 ±3 nm, 798-810 nm
SDL-3240 Series	798-810 nm
SDL-3250 Series	798-810 nm

   All test data is taken at 25°C, 200 µsec pulse width for the nominal tested duty factor as listed for each stack. The wavelengths of the linear subassemblies will be chosen to meet the stack wavelength requirements at the above test specifications unless otherwise requested at time of order.

3. Center wavelength tolerance for single linear arrays is ±3 nm. Center wavelength tolerance for stacked arrays is defined as:
   All linear array center wavelengths are within a 4 nm window. The centrum of this window may vary ±3 nm between stacks.

   Contact SDL if multiple stacks will be mounted to a common cooling system or if a manifold subsystem is required.

4. A dry N_2 environment should be provided by the user when operating at temperatures below the dew point.

5. **Thermoelectric Cooler ("B" Package Lasers only)**

Max. Drive Current	3.5 A
Max. Drive Voltage	8.0 V
Thermistor R @ 25°C	10 kΩ

Model Number Code

SDL- 3 2 X X - X X

1 2 3 4 5 6

DIGIT 1: PRODUCT GROUP
- 3: diode aperture ≥ 1 mm

DIGIT 2: OPERATING MODE
- 2: quasi-cw

DIGIT 3: CHIP POWER
- 3: 60 W peak
- 4: 50 W peak
- 5: 100 W peak

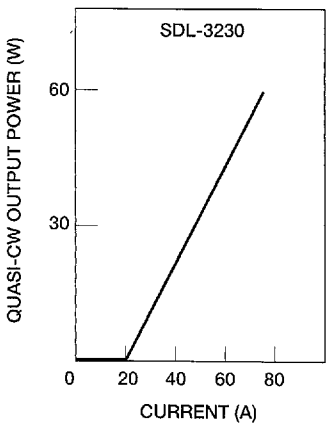
DIGIT 4: PITCH
- 1: 0.4 mm
- 2: 0.8 mm
- 3: 1.2 mm
- 4: 1.6 mm
- 5: 2.0 mm

DIGIT 5: PACKAGE
- A: back-cooled conductive
- B: back-cooled conductive w/TEC
- C: .25 x 1 cm back-cooled impingement
- D: .50 x 1 cm back-cooled impingement
- E: 1 x 1 cm back-cooled impingement
- F: .50 x 4 cm back-cooled impingement
- G: back-cooled conductive, expandable
- H: 1 x 2 cm back-cooled impingement
- J: 1 x 1 cm back-cooled, micro lens array
- K: back-cooled conductive, compact design

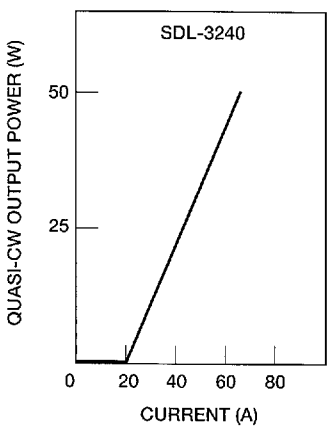
DIGIT 6: NUMBER OF ARRAYS PER STACK
- 1-9: one through nine arrays
- A: 10 arrays
- B: 12 arrays
- C:
- D: 16 arrays
- E:
- F:
- G:
- H: 25 arrays
- J: 48 arrays
- K: 50 arrays

Optical Characteristics

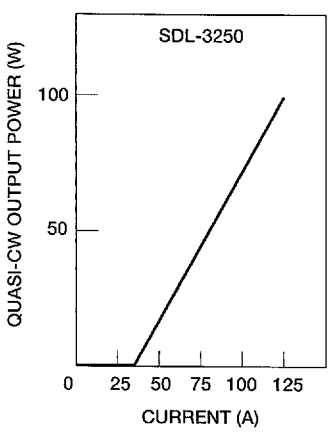
LIGHT vs. CURRENT CHARACTERISTICS



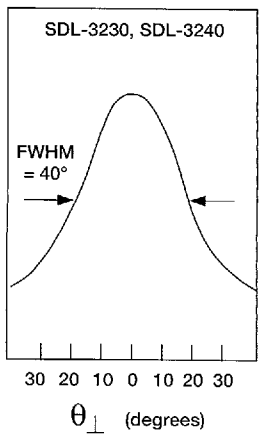
LIGHT vs. CURRENT CHARACTERISTICS



LIGHT vs. CURRENT CHARACTERISTICS



FAR FIELD ENERGY DISTRIBUTION



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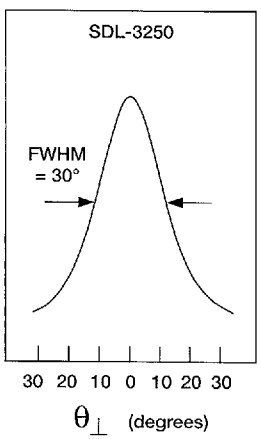

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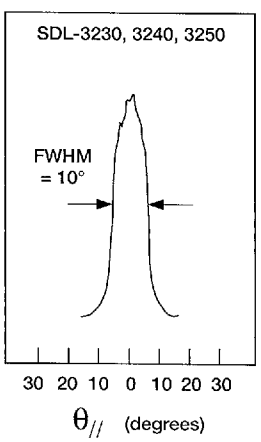

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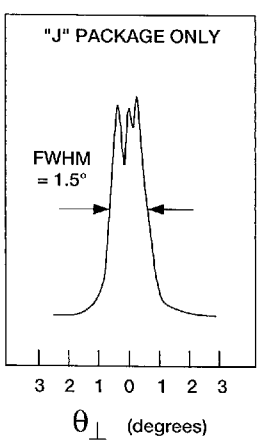


Package Specifications

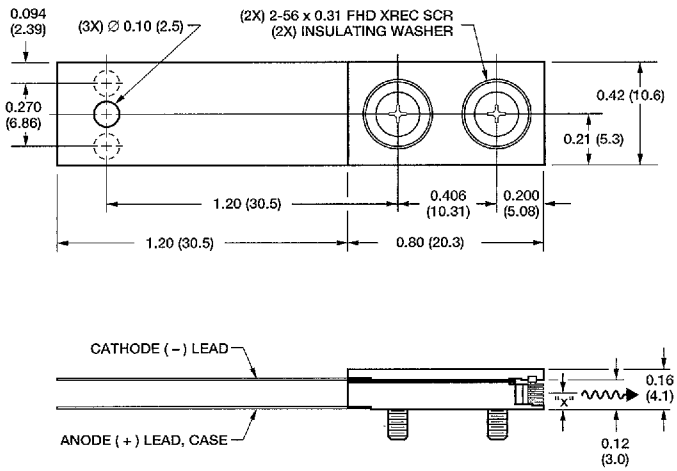
[All dimensions in inches (mm)]

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

A Back-Cooled Conductive Package

Standard Configurations Available

Model Number	Total Power (W)	Nominal Duty Factor (%)	LSA's per Stack
SDL-3251-A1	100	1.3	1
SDL-3251-A2	200	1.3	2
SDL-3251-A3	300	1.3	3
SDL-3251-A4	400	1.3	4
SDL-3251-A5	500	1.3	5
SDL-3251-A6	600	1.3	6
SDL-3231-A1	60	2.0	1
SDL-3231-A2	120	2.0	2
SDL-3231-A3	180	2.0	3
SDL-3231-A4	240	2.0	4
SDL-3231-A5	300	2.0	5
SDL-3231-A6	360	2.0	6



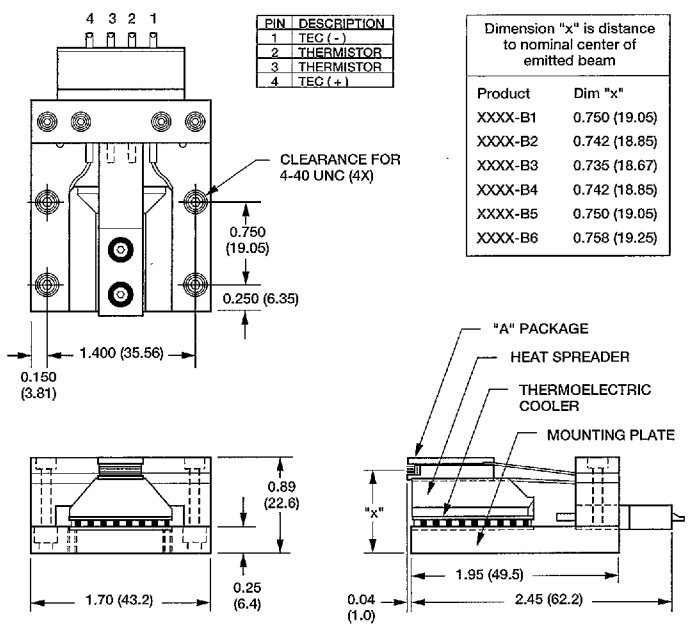
Dimension "x" is distance to nominal center of emitted beam

Product	Dim "x"
XXXX-A1	0.059 (1.49)
XXXX-A2	0.051 (1.29)
XXXX-A3	0.044 (1.12)
XXXX-A4	0.051 (1.29)
XXXX-A5	0.059 (1.49)
XXXX-A6	0.067 (1.70)

B Back-Cooled Conductive Package with TEC

Standard Configurations Available

Model Number	Total Power (W)	Nominal Duty Factor (%)	LSA's per Stack
SDL-3251-B1	100	1.3	1
SDL-3251-B2	200	1.3	2
SDL-3251-B3	300	1.3	3
SDL-3251-B4	400	1.3	4
SDL-3251-B5	500	1.3	5
SDL-3251-B6	600	1.3	6
SDL-3231-B1	60	2.0	1
SDL-3231-B2	120	2.0	2
SDL-3231-B3	180	2.0	3
SDL-3231-B4	240	2.0	4
SDL-3231-B5	300	2.0	5
SDL-3231-B6	360	2.0	6



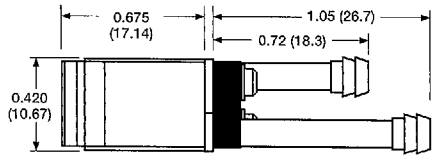
Dimension "x" is distance to nominal center of emitted beam

Product	Dim "x"
XXXX-B1	0.750 (19.05)
XXXX-B2	0.742 (18.85)
XXXX-B3	0.735 (18.67)
XXXX-B4	0.742 (18.85)
XXXX-B5	0.750 (19.05)
XXXX-B6	0.758 (19.25)

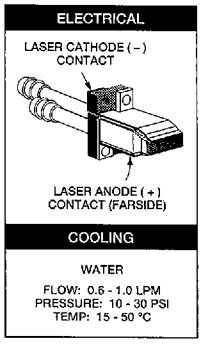
C 0.25 x 1 cm Back-Cooled Impingement Cooler

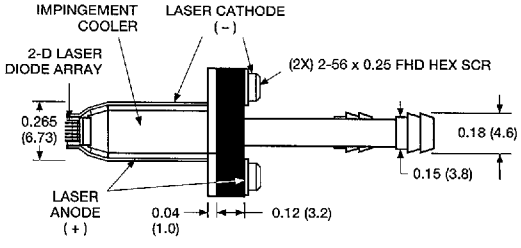
Standard Configurations Available

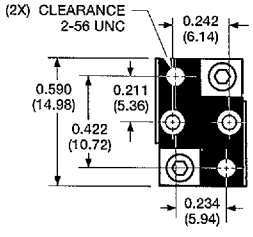
Model Number	Total Power (W)	Nominal Duty Factor (%)	LSA's per Stack
SDL-3255-C1	100	4.0	1
SDL-3252-C3	300	3.0	3
SDL-3251-C6	600	2.0	6
SDL-3245-C1	50	20.0	1
SDL-3235-C1	60	6.0	1
SDL-3232-C3	180	6.0	3
SDL-3231-C6	360	4.0	6



COOLANT FLOW IS NON-DIRECTIONAL



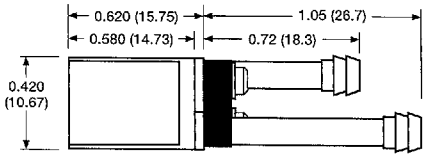




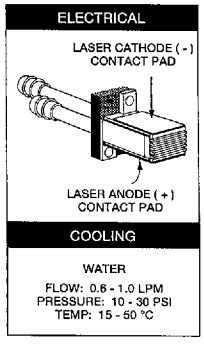
D 0.5 x 1 cm Back-Cooled Impingement Cooler

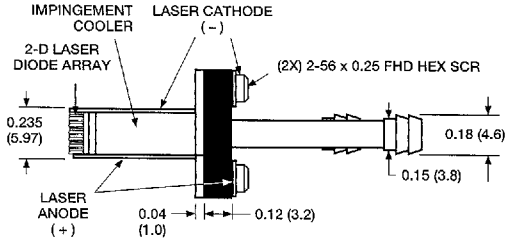
Standard Configurations Available

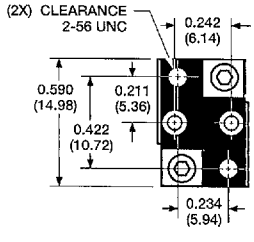
Mode Number	Total Power (W)	Nominal Duty Factor (%)	LSA's per Stack
SDL-3252-D6	600	3.0	6
SDL-3251-DB	1200	2.0	12
SDL-3232-D6	360	6.0	6
SDL-3231-DB	720	4.0	12



COOLANT FLOW IS NON-DIRECTIONAL







Package Specifications

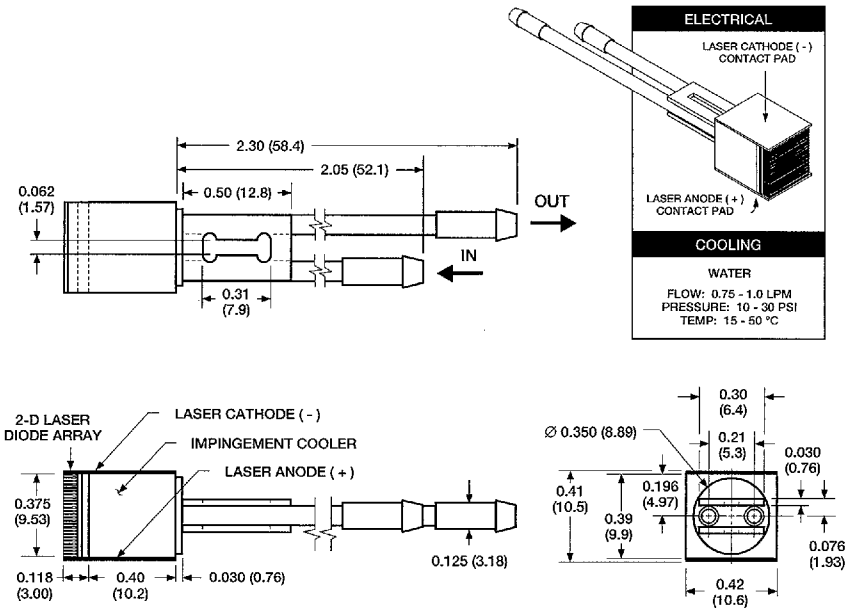
[All dimensions in inches (mm)]

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

E 1 x 1 cm Back-Cooled Impingement Cooler

Standard Configurations Available

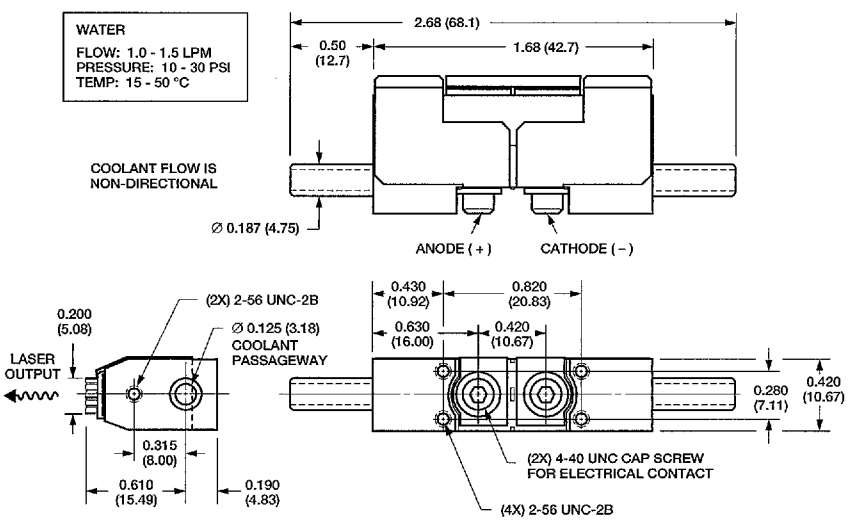
Model Number	Total Power (W)	Nominal Duty Factor (%)	LSA's per Stack
SDL-3252-EB	1200	3.0	12
SDL-3251-EH	2500	2.0	25
SDL-3232-EB	720	6.0	12
SDL-3231-EH	1500	4.0	25



F 4 x 0.5 cm Back-Cooled Impingement Cooler

Standard Configurations Available

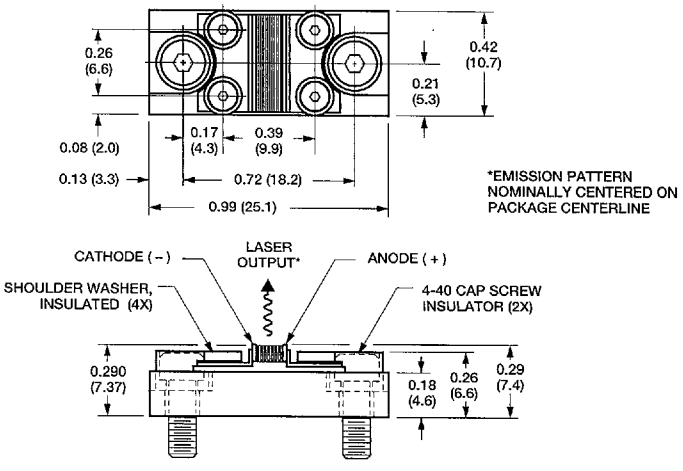
Model Number	Total Power (W)	Nominal Duty Factor (%)	LSA's per Stack
SDL-3254-FB	1200	4.0	12
SDL-3253-FD	1600	4.0	16
SDL-3245-F2	100	20.0	2
SDL-3245-F4	200	20.0	4
SDL-3244-FB	600	20.0	12
SDL-3243-FD	800	20.0	16
SDL-3234-FB	720	6.0	12
SDL-3233-FD	960	6.0	16



G 1 cm Back-Cooled Package (Expandable to accommodate larger stacks)

Standard Configurations Available

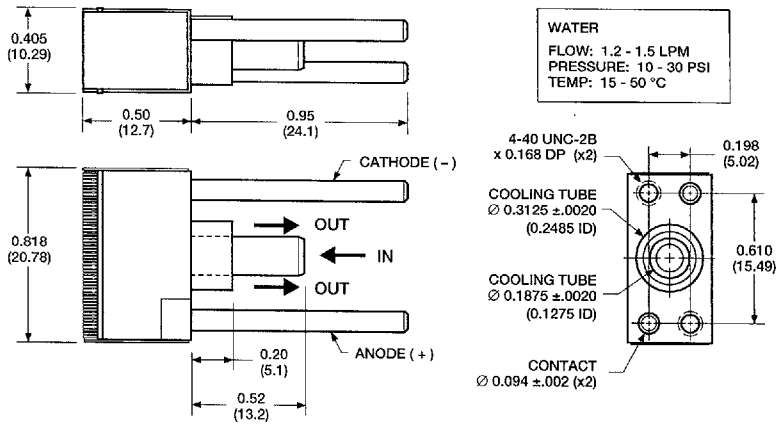
Model Number	Total Power (W)	Nominal Duty Factor (%)	LSA's per Stack
SDL-3251-G1	100	1.3	1
SDL-3251-G2	200	1.3	2
SDL-3251-G3	300	1.3	3
SDL-3251-G4	400	1.3	4
SDL-3251-G5	500	1.3	5
SDL-3251-G6	600	1.3	6
SDL-3251-G7	700	1.3	7
SDL-3231-G1	60	2.0	1
SDL-3231-G2	120	2.0	2
SDL-3231-G3	180	2.0	3
SDL-3231-G4	240	2.0	4
SDL-3231-G5	300	2.0	5
SDL-3231-G6	360	2.0	6
SDL-3231-G7	420	2.0	7



H 2 x 1 cm Back-Cooled Impingement Cooler (Coaxial Coolant Connection)

Standard Configurations Available

Model Number	Total Power (W)	Nominal Duty Factor (%)	LSA's per Stack
SDL-3253-HD	1600	4.0	16
SDL-3252-HH	2500	4.0	25
SDL-3251-HK	5000	2.0	50
SDL-3243-HD	800	20.0	16
SDL-3242-HH	1250	8.0	25
SDL-3233-HD	960	6.0	16
SDL-3232-HH	1500	6.0	25
SDL-3231-HK	3000	4.0	50



Package Specifications

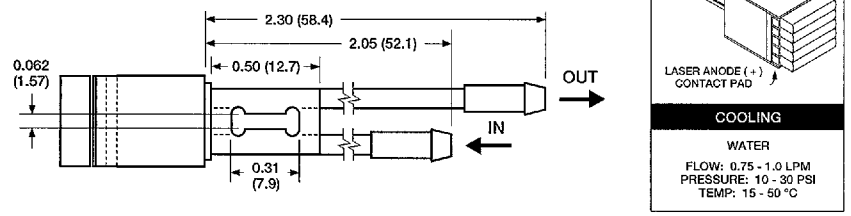
[All dimensions in inches (mm)]

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

J 1 x 1 cm Back-Cooled Impingement Cooler with Micro Lens Array

Standard Configurations Available

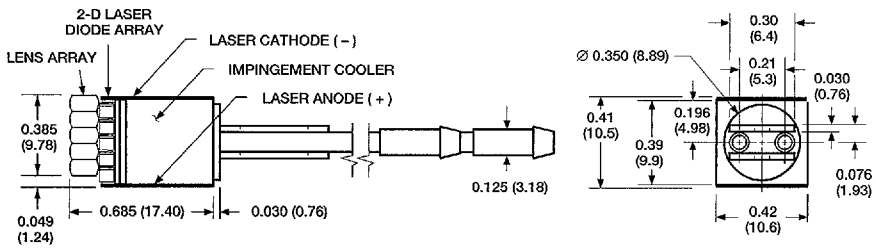
Model Number	Total Power (W)	Nominal Duty Factor (%)	LSA's per Stack
SDL-3255-J5	400	4.0	5
SDL-3245-J5	200	20.0	5
SDL-3235-J5	240	6.0	5



Divergence Angles

$\theta_{\perp} = 1.5° \pm 1.5°$

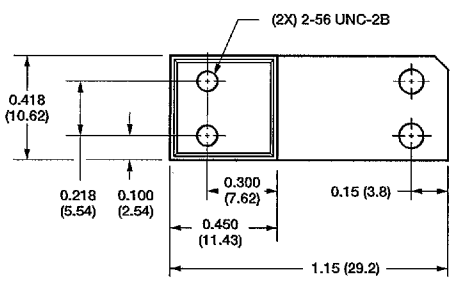
$\theta_{//} = 10°$



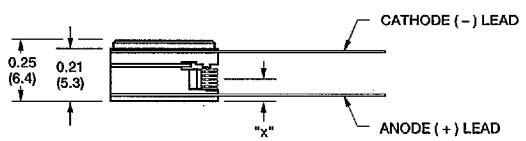
K Back-Cooled Conductive, Compact Design

Standard Configurations Available

Model Number	Total Power (W)	Nominal Duty Factor (%)	LSA's per Stack
SDL-3251-K1	100	1.3	1
SDL-3251-K2	200	1.3	2
SDL-3251-K3	300	1.3	3
SDL-3251-K4	400	1.3	4
SDL-3251-K5	500	1.3	5
SDL-3251-K6	600	1.3	6
SDL-3231-K1	60	2.0	1
SDL-3231-K2	120	2.0	2
SDL-3231-K3	180	2.0	3
SDL-3231-K4	240	2.0	4
SDL-3231-K5	300	2.0	5
SDL-3231-K6	360	2.0	6



Dimension "x" is distance to nominal center of emitted beam	
Product	Dim "x"
XXXX-K1	0.086 (2.18)
XXXX-K2	0.078 (1.98)
XXXX-K3	0.071 (1.80)
XXXX-K4	0.078 (1.98)
XXXX-K5	0.086 (2.18)
XXXX-K6	0.093 (2.36)



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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 beam along its optical axis.

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.

Quasi-cw laser diodes may be damaged by excessive drive current or switching transients. Use pulse current drivers specifically designed to eliminate transients in the output. Electrically short the array at all times when not in use.

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 0.5 °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 antistatic 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.

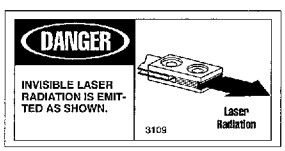
SERIAL NUMBER IDENTIFICATION LABEL

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

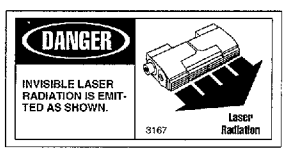
OUTPUT POWER DANGER LABELS

≤ 5 ARRAYS ≤ 50 ARRAYS

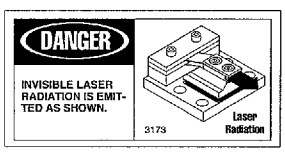
PACKAGE APERTURE LABELS



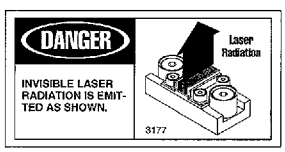
"A" PACKAGE DIODES



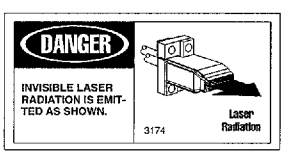
"F" PACKAGE DIODES



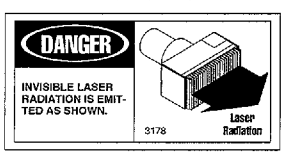
"B" PACKAGE DIODES



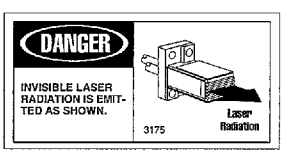
"G" PACKAGE DIODES



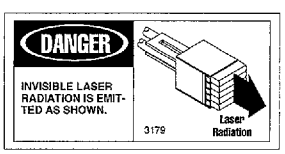
"C" PACKAGE DIODES



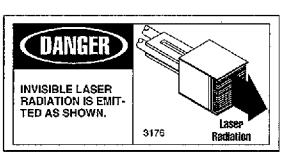
"H" PACKAGE DIODES



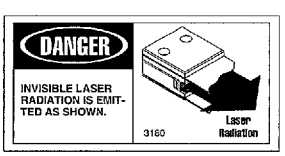
"D" PACKAGE DIODES



"J" PACKAGE DIODES



"E" PACKAGE DIODES



"K" PACKAGE DIODES