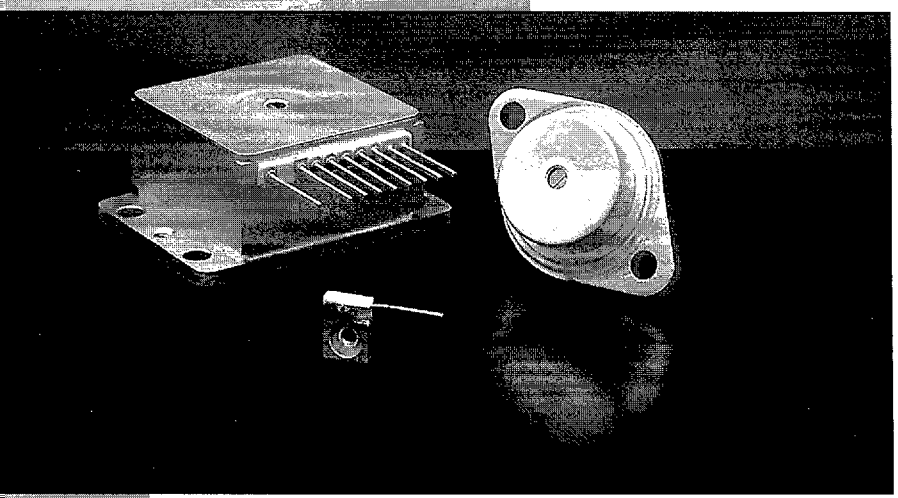
SDL 2300 SERIES



Key Features

4, 3, 2, 1.2, 0.5 W cw Power

500, 370, 200, 100 and 50 µm Apertures

High Efficiency MOCVD Quantum Well Design

Internal TEC Option For Wavelength Control

High Reliability

Open Heat Sink, Window, and Fiber Packages

High Brightness Tapered Fiber Options

UP TO 4.0 WATT CW HIGH BRIGHTNESS GaAlAs LASER DIODES

High cw optical power and high brightness are offered by the SDL-2300 Series of laser diodes. A combination of small aperture and low beam divergence make the SDL-2300 Series the highest brightness cw lasers offered by SDL. These products are ideal for applications such as:

- solid-state laser pumping
- power-down-a-fiber
- medical and ophthalmic systems
- free-space communication
- beacons and illumination

High brightness and power are achieved by advanced MOCVD epitaxial semiconductor growth techniques combined with a broad area lateral index guided structure. The quantum well active layer provides low threshold and high electrical-to-optical power at small aperture dimensions.

The SDL-2300 Series lasers are partially coherent broad area emitters with relatively uniform emission over the emitting aperture. They operate in multiple longitudinal modes with spectral width of about 2 nm. The far field in the plane parallel to the junction exhibits the complex pattern typical of broad area emitters and is nearly gaussian in the plane perpendicular to the junction. Coherence length is ~0.5 mm. The polarization ratio is ~20:1.

The high efficiency of the quantum well structure combined with low thermal resistance epi-down chip mounting and low thermal resistance packages provide minimum junction temperature at high optical power. Low junction temperature and low thermal resistance packages extend lifetime and increase reliability.

Convenient package options such as open heatsink, window and fiber pigtail output options allow easy integration into user systems. The 2:1 tapered fiber output P3 option provides a 4X improvement in brightness and efficient coupling into 50 or 100 µm core fiber systems.

SDL®

Specifications

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

Model Number	CW Output Power (W)	Differential Quantum Efficiency (W/A)	Total Conversion Efficiency (%)	Emitting Dimensions[8] W X H (µm)	Beam Divergence $\theta_\perp$, $\theta_{//}$ or θ (deg FWHM)	Fiber Core Dia. Ø (µm)	Fiber Numerical Aperture	Threshold Current (A)
SDL-2380-C	4.0	0.80 (50%)	30	500 x 1.0	34, 12	—	—	2.0
SDL-2380-P1	4.0	0.80 (50%)	30	500 x 1.0	34, 12	—	—	2.0
SDL-2381-P1	4.0	0.80 (50%)	30	500 x 1.0	34, 12	—	—	2.0
SDL-2382-P1	4.0	0.80 (50%)	30	500 x 1.0	34, 12	—	—	2.0
SDL-2340-C	3.0	0.80 (50%)	30	370 x 1.0	34, 12	—	—	1.6
SDL-2340-P1	3.0	0.80 (50%)	30	370 x 1.0	34, 12	—	—	1.6
SDL-2341-P1	3.0	0.80 (50%)	30	370 x 1.0	34, 12	—	—	1.6
SDL-2342-P1	3.0	0.80 (50%)	30	370 x 1.0	34, 12	—	—	1.6
SDL-2370-C	2.0	0.80 (50%)	30	200 x 1.0	32, 12	—	—	0.9
SDL-2370-H1	2.0	0.80 (50%)	30	200 x 1.0	32, 12	—	—	0.9
SDL-2370-P2	1.2	0.50 (30%)	20	—	60	200	0.5	0.9
SDL-2370-P3[5]	1.2	0.50 (30%)	20	—	48	100	0.4	0.9
SDL-2371-H1	2.0	0.80 (50%)	30	200 x 1.0	32, 12	—	—	0.9
SDL-2371-P2	1.2	0.50 (30%)	20	—	60	200	0.5	0.9
SDL-2371-P3[5]	1.2	0.50 (30%)	20	—	48	100	0.4	0.9
SDL-2372-P1	2.0	0.80 (50%)	30	200 x 1.0	32, 12	—	—	0.9
SDL-2372-P2	1.2	0.50 (30%)	20	—	60	200	0.5	0.9
SDL-2372-P3[5]	1.2	0.50 (30%)	20	—	48	100	0.4	0.9
SDL-2360-C	1.2	0.80 (50%)	30	100 x 1.0	32, 12	—	—	0.4
SDL-2360-H1	1.2	0.80 (50%)	30	100 x 1.0	32, 12	—	—	0.4
SDL-2360-P2	0.7	0.50 (30%)	20	—	35	100	0.3	0.4
SDL-2360-P3[5]	0.7	0.50 (30%)	20	—	48	50	0.4	0.4
SDL-2361-H1	1.2	0.80 (50%)	30	100 x 1.0	32, 12	—	—	0.4
SDL-2361-P2	0.7	0.50 (30%)	20	—	35	100	0.3	0.4
SDL-2361-P3[5]	0.7	0.50 (30%)	20	—	48	50	0.4	0.4
SDL-2362-P1	1.2	0.80 (50%)	30	100 x 1.0	32, 12	—	—	0.4
SDL-2362-P2	0.7	0.50 (30%)	20	—	35	100	0.3	0.4
SDL-2362-P3[5]	0.7	0.50 (30%)	20	—	48	50	0.4	0.4
SDL-2350-C	0.5	0.80 (50%)	30	50 x 1.0	32, 12	—	—	0.2
SDL-2350-H1	0.5	0.80 (50%)	30	50 x 1.0	32, 12	—	—	0.2
SDL-2350-H2	0.3	0.50 (30%)	20	—	35	50	0.3	0.2
SDL-2351-H1	0.5	0.80 (50%)	30	50 x 1.0	32, 12	—	—	0.2
SDL-2351-H2	0.3	0.50 (30%)	20	—	35	50	0.3	0.2
SDL-2352-H1	0.5	0.80 (50%)	30	50 x 1.0	32, 12	—	—	0.2
SDL-2352-P1	0.5	0.80 (50%)	30	50 x 1.0	32, 12	—	—	0.2
SDL-2352-P2	0.3	0.50 (30%)	20	—	35	50	0.3	0.2

1. Features common to all SDL-2300 diodes include:
   a. Duty Factor of 100%.
   b. Rise and fall times of 500 ps. (C pkg)
   c. Spectral width of 2 nm FWHM.
   d. Temperature coefficient of wavelength is approximately 0.27 to 0.3 nm/°C
   e. Temp. 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 160°K.
   f. Temperature coefficient of operating current is approximately 1.0 % per °C.

2. Modulation bandwidth of cw laser diodes is approximately 1 GHz for C package diodes. H and P 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 range of SDL-2350, 2360 and 2370 Series laser diodes is 785 to 815 nm. Wavelength range of SDL-2340 and 2380 Series is 797 to 815 nm. At pump wavelengths 785, 792, 797 and 808 nm, a tolerance of ±3 nm is permitted. The SDL-2360 and SDL-2370 Series are also available in the wavelength range 830-840 nm ±10 nm.

5. The P3 package includes a tapered fiber which tapers from a core diameter matching diode emitting area to an output core diameter one half of that dimension. Increased brightness and ability to couple high power into small core fiber systems are the result. (Covered under U.S. Patents #4,763,975 and #4,688,884).

Absolute Maximum Ratings

Operating Current (A)	Series Resistance (Ω)	Thermal Resistance (°C/W)	Recommended Case Temperature (°C)	CW Output Power (W)	Reverse Voltage (volts)	Case Operating Temp. (°C)	Storage Temp. Range (°C)	Lead Soldering Temp. (°C for 5 sec)
6.3	0.08	4	-20 to 30	4.2	3	-20 to 50	-55 to 80	250
6.3	0.08	4	-20 to 30	4.2	3	-20 to 50	-55 to 60	250
6.3	0.08	4	-20 to 30	4.2	3	-20 to 50	-55 to 60	250
6.3	0.08	NA	-20 to 30	4.2	3	-20 to 50	-55 to 60	250
4.9	0.1	6	-20 to 30	3.2	3	-20 to 50	-55 to 80	250
4.9	0.1	6	-20 to 30	3.2	3	-20 to 50	-55 to 60	250
4.9	0.1	6	-20 to 30	3.2	3	-20 to 50	-55 to 60	250
4.9	0.1	NA	-20 to 30	3.2	3	-20 to 50	-55 to 60	250
3.1	0.12	8	-20 to 30	2.2	3	-20 to 50	-55 to 80	250
3.1	0.12	8	-20 to 30	2.2	3	-20 to 50	-55 to 80	250
3.1	0.12	8	-20 to 30	1.3	3	-20 to 50	-55 to 80	250
3.1	0.12	8	-20 to 30	1.3	3	-20 to 50	-55 to 80	250
3.1	0.12	8	-20 to 30	2.2	3	-20 to 50	-55 to 80	250
3.1	0.12	8	-20 to 30	1.3	3	-20 to 50	-55 to 80	250
3.1	0.12	8	-20 to 30	1.3	3	-20 to 50	-55 to 80	250
3.1	0.12	NA	-20 to 30	2.2	3	-20 to 50	-55 to 80	250
3.1	0.12	NA	-20 to 30	1.3	3	-20 to 50	-55 to 80	250
3.1	0.12	NA	-20 to 30	1.3	3	-20 to 50	-55 to 80	250
1.6	0.25	10	-20 to 30	1.3	3	-20 to 50	-55 to 80	250
1.6	0.25	10	-20 to 30	1.3	3	-20 to 50	-55 to 80	250
1.6	0.25	10	-20 to 30	0.8	3	-20 to 50	-55 to 80	250
1.6	0.25	10	-20 to 30	0.8	3	-20 to 50	-55 to 80	250
1.6	0.25	10	-20 to 30	1.3	3	-20 to 50	-55 to 80	250
1.6	0.25	10	-20 to 30	0.8	3	-20 to 50	-55 to 80	250
1.6	0.25	10	-20 to 30	0.8	3	-20 to 50	-55 to 80	250
1.6	0.25	NA	-20 to 30	1.3	3	-20 to 50	-55 to 80	250
1.6	0.25	NA	-20 to 30	0.8	3	-20 to 50	-55 to 80	250
1.6	0.25	NA	-20 to 30	0.8	3	-20 to 50	-55 to 80	250
0.8	0.5	12	-20 to 30	0.55	3	-20 to 50	-55 to 80	250
0.8	0.5	12	-20 to 30	0.55	3	-20 to 50	-55 to 80	250
0.8	0.5	12	-20 to 30	0.33	3	-20 to 50	-55 to 80	250
0.8	0.5	12	-20 to 30	0.55	3	-20 to 50	-55 to 80	250
0.8	0.5	12	-20 to 30	0.33	3	-20 to 50	-55 to 80	250
0.8	0.5	NA	-20 to 30	0.55	3	-20 to 50	-55 to 80	250
0.8	0.5	NA	-20 to 30	0.55	3	-20 to 50	-55 to 80	250
0.8	0.5	NA	-20 to 30	0.33	3	-20 to 50	-55 to 80	250

6. **Monitor Photodiode**

Sensitivity	0.3 to 10 µA/mW
Capacitance	6 pf
Breakdown Voltage	25 V
Operating Voltage	10 V

7. **Thermoelectric Cooler**

Max. Drive Current	
For "P" Pkg Lasers	3.5 A
For SDL-2352-H1	1.4 A
Max. Drive Voltage	
For "P" Pkg Lasers	8.0 V
For SDL-2352-H1	4.5 V
Thermistor R @ 25°C	10 kΩ

8. The SDL-2340 and SDL-2380 near field consists of two active segments separated by an isolation space to produce specified aperture. The SDL-2350, 2360 and 2370 near field consists of a single active segment with specified aperture.

9. Definition of Part Numbers:

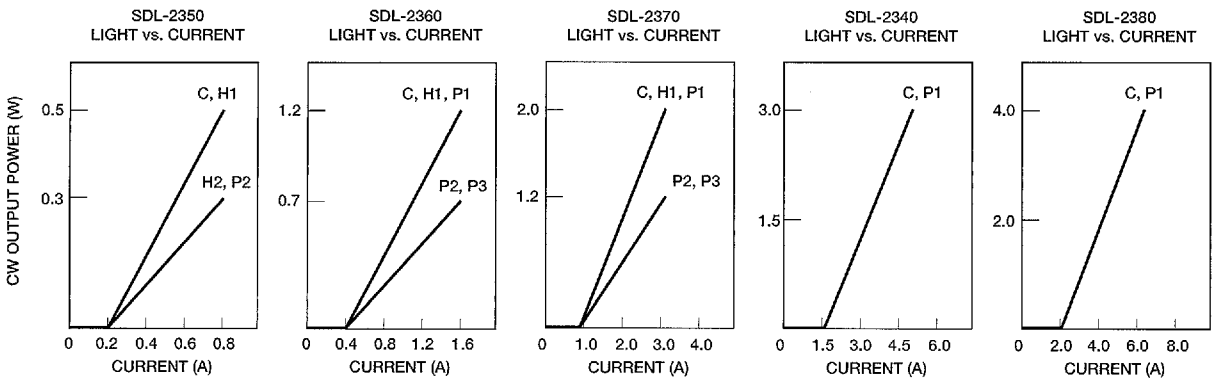
SDL-23 X X - (C, H1, H2, P1, P2 or P3 packages)

- 0 - No Options
- 1 - Monitor Photodiode (MPD)
- 2 - MPD, TE Cooler

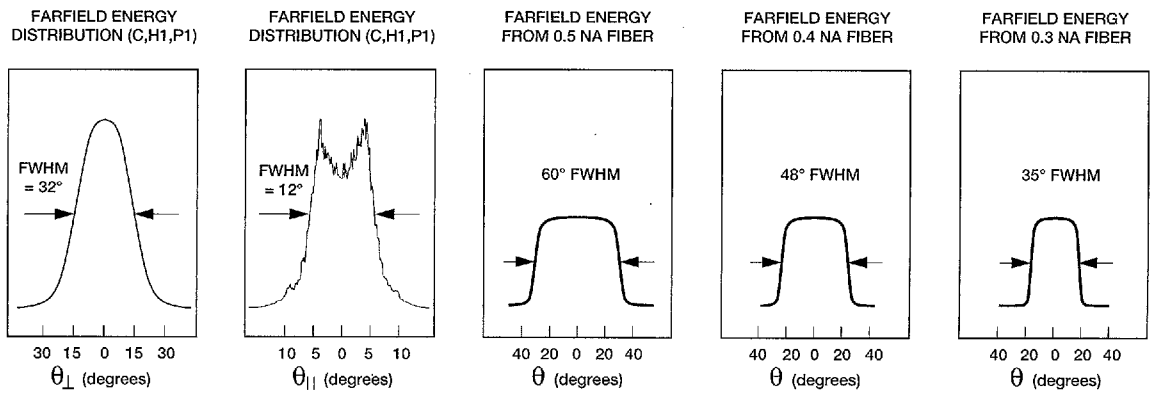
- 4 - 3.0 W cw
- 5 - 0.5 W cw
- 6 - 1.2 W cw
- 7 - 2.0 W cw
- 8 - 4.0 W cw

Optical Characteristics

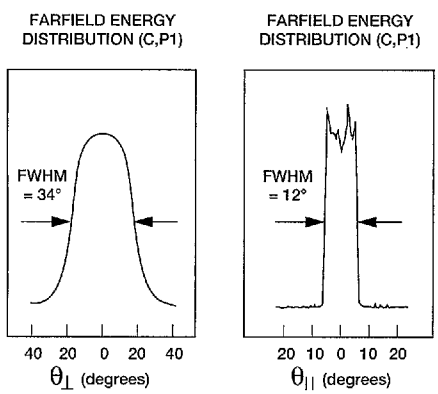
Light vs. Current Characteristics



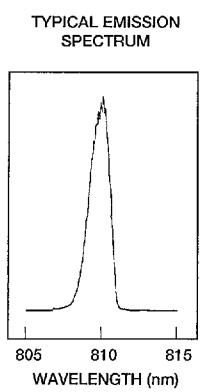
SDL-2350, SDL-2360 and SDL-2370 Output Characteristics



SDL-2340 and SDL-2380 Output Characteristics



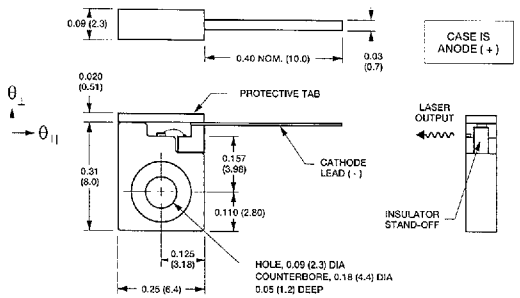
Spectral Characteristic



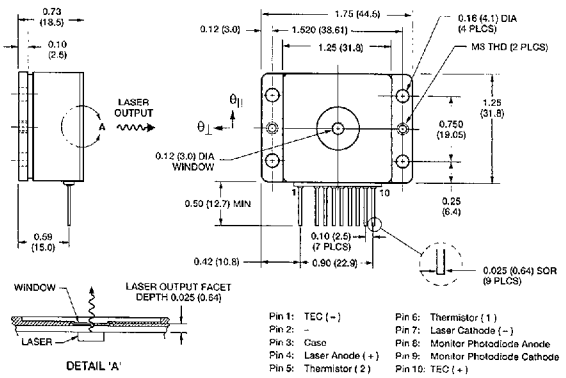
Package Specifications

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

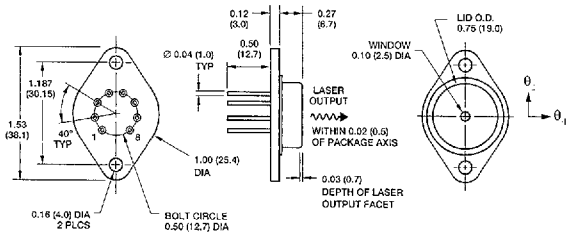


P1 HIGH HEAT LOAD (≤1 W) WINDOW PACKAGE



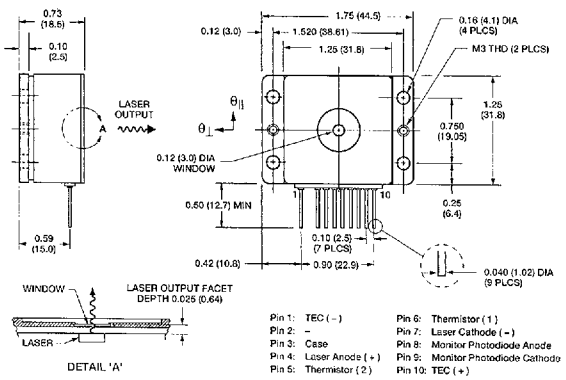
Pin 1: TEC (+)
Pin 2: –
Pin 3: Case
Pin 4: Laser Anode (+)
Pin 5: Thermistor (2)
Pin 6: Thermistor (1)
Pin 7: Laser Cathode (–)
Pin 8: Monitor Photodiode Anode
Pin 9: Monitor Photodiode Cathode
Pin 10: TEC (+)

H1 TO-3 WINDOW PACKAGE



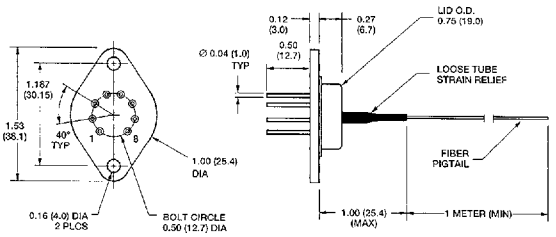
Pin 1: TEC (+)
Pin 2: Thermistor (1)
Pin 3: Thermistor (2)
Pin 4: Laser Cathode (–)
Pin 5: Laser Anode (+), Case
Pin 6: Monitor Photodiode Anode
Pin 7: Monitor Photodiode Cathode
Pin 8: TEC (–)

P1 HIGH HEAT LOAD (>1 W) WINDOW PACKAGE



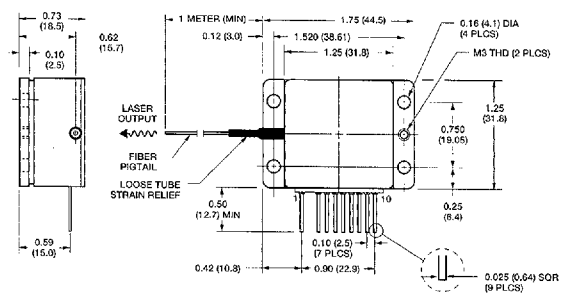
Pin 1: TEC (–)
Pin 2: –
Pin 3: Case
Pin 4: Laser Anode (+)
Pin 5: Thermistor (2)
Pin 6: Thermistor (1)
Pin 7: Laser Cathode (–)
Pin 8: Monitor Photodiode Anode
Pin 9: Monitor Photodiode Cathode
Pin 10: TEC (+)

H2 TO-3 FIBER PIGTAIL 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 (–)

P2, P3 HIGH HEAT LOAD FIBER PACKAGE



Pin 1: TEC (–)
Pin 2: –
Pin 3: Case
Pin 4: Laser Anode (+)
Pin 5: Thermistor (2)
Pin 6: Thermistor (1)
Pin 7: Laser Cathode (–)
Pin 8: Monitor Photodiode Anode
Pin 9: Monitor Photodiode Cathode
Pin 10: TEC (+)

SDL-2300 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, or directly into the fiber 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 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 anti-static techniques when handling laser diodes.

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: I op:
This laser product complies with 21 CFR 1040 as applicable

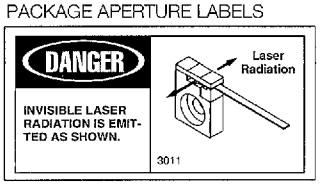
OUTPUT POWER DANGER LABELS

SDL-2340, 2370, 2380

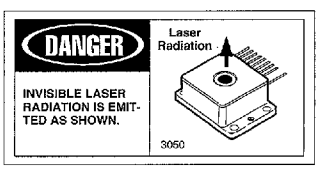
SDL-2360

SDL-2350

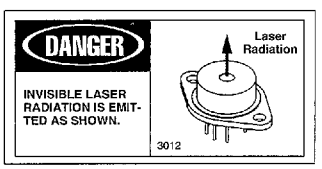
PACKAGE APERTURE LABELS



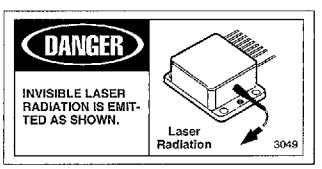
"C" PACKAGE DIODES



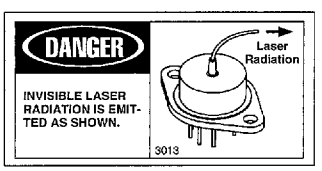
"P1" PACKAGE DIODES



"H1" PACKAGE DIODES



"P2" or "P3" PACKAGE DIODES



"H2" PACKAGE DIODES