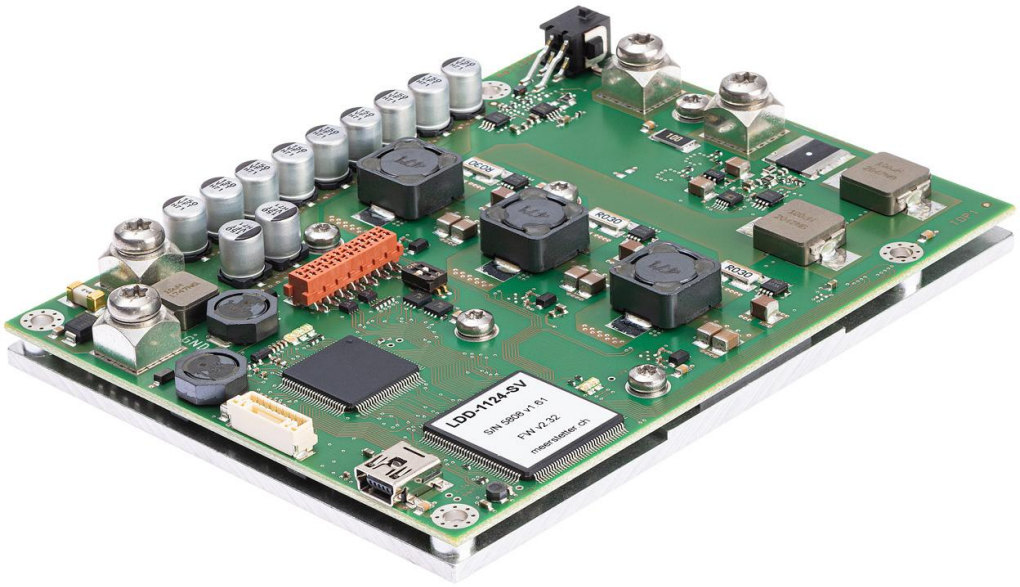
meerstetter engineering
Member of Berndorf Group

Datasheet –
Laser Diode Driver LDD-1124 (0- 1.5 A / 0- 15 V)



Support / First steps

Meerstetter Engineering provides technical support for all products and helps you to integrate a product into your solution. Most of your questions should be solved by reading the provided user manuals of the corresponding product or the FAQ (frequently asked questions).
For further help or if you have any other questions, please do not hesitate to contact us. We are happy to help you. You can contact us by email support@meerstetter.ch.

Meerstetter's product family compatibility

The Meerstetter LDD and TEC-Family have been developed to work along with each other. They share the same platform bus, communication protocol and hardware architecture. See Table for an Overview over the LDD- and TEC-Families.

LDD-Family		
LDD-1321	0-1.5 A / 0- 14 V	CW, Add on TEC Controller available
LDD-1301	0-20 A / 0.5- 45 V	1 ms - CW
LDD-1303	0-20 A / 1- 120 V	1 ms - CW
LDD-1137	0-75 A / 0- 70 V	0.5 µs - CW, modulated, QCW and pulsed modes
LDD-1124-SV	0-1.5 A / 0- 15 V	1 µs - CW, modulated, QCW and pulsed modes
LDD-1121-SV	0-15 A / 0- 15 V	1 µs - CW, modulated, QCW and pulsed modes
LDD-1125-HV	0-30 A / 0- 27 V	1 µs - CW, modulated, QCW and pulsed modes
TEC-Family		
TEC-1092	±1.2 A / ±9.6 V	Micro, single channel
TEC-1091	±4 A / ±21 V	Small, single channel
TEC-1089-SV	±10 A / ±21 V	Medium, single channel
TEC-1162	±5 A / ±56 V	Medium-high, single channel
TEC-1090-HV	±16 A / ±30 V	Large, single channel
TEC-1163	±25 A / ±56 V	Extra-large, single channel
TEC-1161-4A	2 x (±4 A / ±21 V)	Small, dual channel
TEC-1161-10A	2 x (±10 A / ±21 V)	Medium, dual channel
TEC-1122-SV	2 x (±10 A / ±21 V)	Medium, dual channel
TEC-1166	2 x (±5 A / ±56 V)	Medium-high, dual channel
TEC-1123-HV	2 x (±16 A / ±30 V)	Large, dual channel
TEC-1167	2 x (±25 A / ±56 V)	Extra-large, dual channel

Advanced OEM Laser Diode Driver with Laser Power Control [LPC optional]

RoHS COMPLIANT

The LDD-1124 is an innovative laser diode driver that contains a specialized current source able to precision-drive laser diodes in continuous / modulated operation. Equipped with optional laser power measurement circuitry (photodiode input), the LDD-1124-LPC can also be operated as a Laser Power Controller.

Core element of the LDD's internal current source is the generation of highly precise 333 ps timing PWM steps that results in high resolution and very low ripple current.
The output is short-circuit safe.

For ultimate laser diode protection the supervision of critical system values is directly implemented in hardware. This results in very fast switch-off times (<8 µs) in case of limit value violation. The LDD-1124 also monitors laser diode temperature (NTC thermistor input).
The LDD-1124 is fully digitally controlled; its firmware is upgradeable to offer various communication options and to meet specific customer requirements.
Current, laser power [LPC option] and temperature measurement hardware can be calibrated.

For basic applications or device evaluation, only a power supply and a laser diode need to be connected to the LDD-1124. The device can operate stand-alone in current control mode, internal generators (on board) allow for parametric definition of flexible output waveforms.
The included PC-Software (USB / RS485) facilitates configuration, control, monitoring and live diagnosis of the LDD. Current and laser power [LPC option] charting is also available from within the software.
All device settings are saved in non-volatile memory and can be backed up and restored.

For remote / OEM applications, the LDD-1124 may be fully controlled by a system bus that features RS485 communication, interlock and 6 reserve lines.

The LDD-1124 is part of the LDD-Family of Meerstetter laser diode drivers, which are designed to operate alongside devices of the TEC-Family of Peltier controllers. Both families of drivers share the same system bus protocol, design concept and technology.

Features

-SV (Standard Voltage) Version:

- DC Input Voltage: 12-24 V
- Output Voltage: 0-15 V

Power Stage:

- Output Current: 0-1.5 A, < 0.1 % Ripple
- Temperature Coefficient: Typ: 15 ppm/K
- CW Current Resolution: 30 µA

Laser Power Control (LPC): [LPC option]

- CW Laser Power Control: Configurable PID
- Start up phase: Fully parameterizable
- LPC Feedback. $PD_{Current}$: up to 4 mA

Main Features:

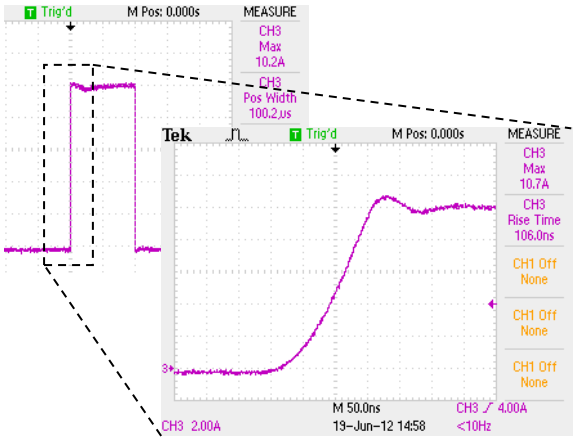
- Internal Generators: Nominal Current
- Four Lookup Table with up to 16000 Samples
- Error: Ultra-Fast Switch-off for optimal LD protection
- Configuration / Diagnosis: on PC (via USB / RS485)
- Dimensions (L x W x H): 120 mm x 90 mm x 18 mm
- Efficiency: >TBD% (@ > 50 % Load)
- Cooling: over Base Plate

Interfaces

- USB 2.0 1kV isolated (FTDI Chip)
- 2x RS485 / RS422
- NTC for LD Temp.

Digital I/O, 3.3 V / 5 V

- Interlock (Enable)
- Generator Trigger Input
- And some more configurable functions



Absolute Maximum Ratings	
Supply voltage (DC)	27 V
Supply current (DC)	4 A (On Board Fuse)
Output current	1.85 A
Output voltage	V_{IN}

Operating Ratings	
System base plate	< 50°C
Operation temperature	0 – 60°C
Storage	-30 – 70°C
Humidity	5 – 95%, non-condensing

Electrical Characteristics

Unless otherwise noted: T_A = 25°C, V_{IN} = 24 V, V_{LD} = 10 V, LDD-1124-SV

Symbol	Parameter	Conditions	Min	Typ	Max	Units
DC Power Supply Input:						
V_{IN}	Supply voltage		11.5	24	26.5	V
V_{IN_RIPPLE}	Ripple tolerance				300	mV_{PP}
System Characteristics:						
$\eta_{50\%}$	Power efficiency	@ 50% load		TBD		%
$\eta_{90\%}$	Power efficiency	@ 90% load		TBD		%

Output Characteristics

Unless otherwise noted: T_A = 25 °C, V_{IN} = 24 V, V_{LD} = 10 V, LDD-1124-SV

Symbol	Parameter	Conditions	Min	Typ	Max	Units
Output CW:						
I_{OUT}	Current range		0		1.5	A
$T_{coefficient}$	Temp. coefficient	I_{out} = 1.5A , T_A = 25°C - 50°C, *not validated		25*	75*	ppm/K
I_{OUT_RES}	Current resolution			30		µA
I_{OUT_RIPPLE}	Current ripple	I_{out} > 100mA		TBD	TBD	mA
V_{OUT_MAX}	Diode voltage		0		15	V
V_{OUT_LIMIT}	Output voltage			V_{IN} - 8		V
P_{OUT}	Output power	V_{LD} = 15 V			22.5	W
f_{CW}	Current change	For L_{Load} <100 nH, higher f_{CW} are possible		TBD		kHz
I_{OUT_SLOPE}	Current slope limit	I_{out} > 0.5A		TBD		A/us

Safety Characteristics

Unless otherwise noted: T_A = 25 °C, V_{IN} = 24 V, V_{LD} = 10 V

Symbol	Parameter	Comments	Min	Typ	Max	Units
I/O Ports:						
$t_{OFF_CURRENT}$	Overcurrent			6	8	µs
t_{OFF_OPVAL}	Operating Values	Voltages, currents		100		µs
t_{OFF_SFAIL}	System failure	System status		100		ms

Laser Diode Temperature Measurement

Unless otherwise noted: T_A = 25 °C, V_{IN} = 24 V, NTC = $B_{25/100}$ 3988K R_{25} 10k

Symbol	Parameter	Comments	Min	Typ	Max	Units
Temperature Measurement						
R_{NTC}	NTC Resistance			10		kΩ
T_{RANGE}	Temperature Range		-6		150	°C
$T_{PRECISION}$	Temp. Precision	Not calibrated			1.5	°C

General Purpose Digital I/O Characteristics on X3 (RES1 … RES8)

Unless otherwise noted: T_A = 25°C, V_{IN} = 24 V

Symbol	Parameter	Comments	Min	Typ	Max	Units
Input Characteristics:						
V_{IH}	Logic high input threshold		2.35			V
V_{IL}	Logic low input threshold				0.9	V
V_{IMAX}	Maximum input voltage		-0.3		5.5	V
V_{AN}	Input voltage range	Analog input	0		3	V
Output Characteristics: (RES1 … RES4)						
V_{OH}	Logic high output voltage		2.9	3.3		V
V_{OL}	Logic low output voltage			0	0.4	V
R_S	Series Resistor		170	200	230	Ω
Output Characteristics: (RES5 … RES8)						
V_{OH}	Logic high output voltage		2.9	3.3		V
V_{OL}	Logic low output voltage			0	0.4	V
R_S	Series Resistor		1160	1200	1240	Ω
ESD Protection:						
V_{PP}	ESD discharge	IEC61000−4−2			100	kV

Pulse Operation

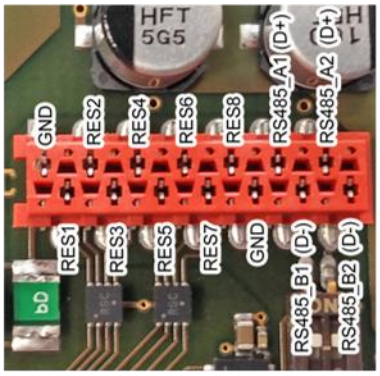
The LDD-1124 is not recommended for Pulse Operation.

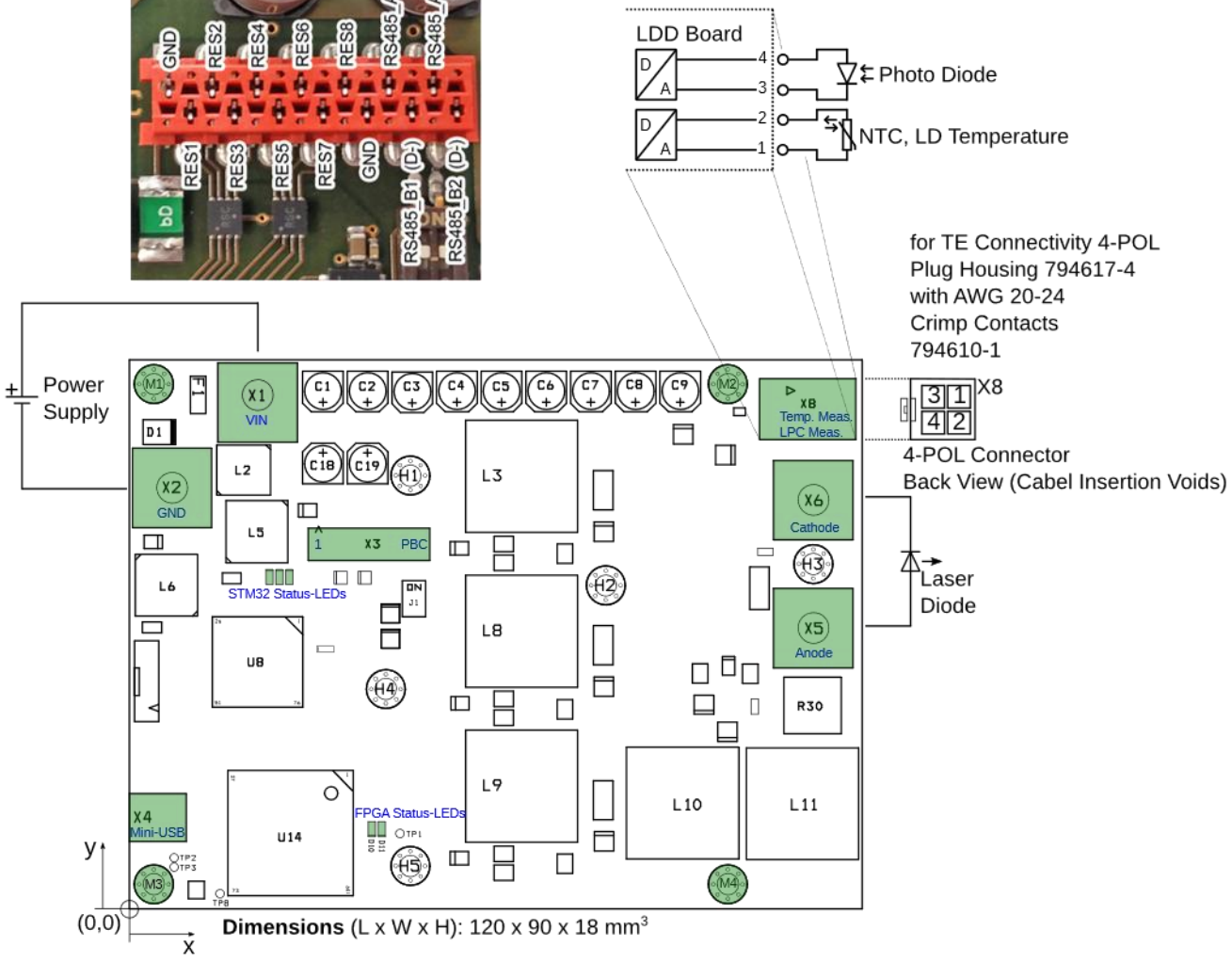
Package Outline and Pin Configuration

Mounting (M3-size Bores, 7.5mm in Length):
M1: x = 4.0 mm, y = 86.0 mm
M2: x = 98.0 mm, y = 86.0 mm
M3: x = 4.0 mm, y = 4.0 mm
M4: x = 98.0 mm, y = 4.0 mm

Power Terminals: M4-size Screws

Pin Descriptions Plattform Bus X3:
TE Connectivity PLUG 14-POL: 8-215083-4





Dimensions (L x W x H): 120 x 90 x 18 mm^3

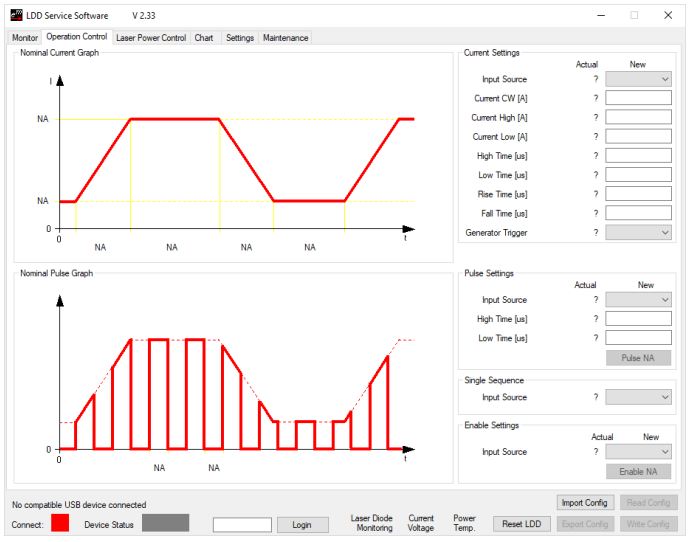
Laser diode, temperature probes, power supply and connectors not included.

Current-Controlled Operation-Modes and Communication Option

The LDD-1124 is an OEM high performance current source that is primarily designed to operate as a fast pulsed laser diode driver but that can also be used in CW mode. It is configured over an industry-standard RS485 or a USB connection, either GUI-driven using the included LDD Service Software, or by direct parameter control using the predefined communication protocol. Basic system status is visually indicated by on-board LEDs, more detailed status information can be polled at any time. The LDD-1124 can operate in a stand-alone configuration as well as in a remotely-controlled manner, with parameters adjusted on the fly. The laser diode driver is current-PID-controlled.

Configuration parameters further include: control source selection, maximum current limits, nominal current ramping, PID controller settings, NTC temperature sensor modeling coefficients, measurement circuitry calibration, error thresholds, communication watchdog, etc. Please refer to the user manual for further information.

LDD Service Software (Example from LDD-1121-SV)



CW Current Modulation by Internal Generator.

The included LDD Service Software is a powerful tool that allows monitoring and full configuration of the LDD-1124 via a standard USB or an RS485 connection from a PC running Windows.

This tool is ideal for laboratory setups, product evaluation diagnosis, debugging and commissioning:

- internal generators set up [see illustration on the left]
- configuration import and export
- data charting with trigger functionality
- error codes and built-in descriptions
- hardware configuration (e.g. calibration)
- maintenance (e.g. firmware upgrades)

Please refer to the laser diode driver user manual for more information on features and system requirements.

Laser Power-Controlled Operation-Mode [Devices with LPC Option only]

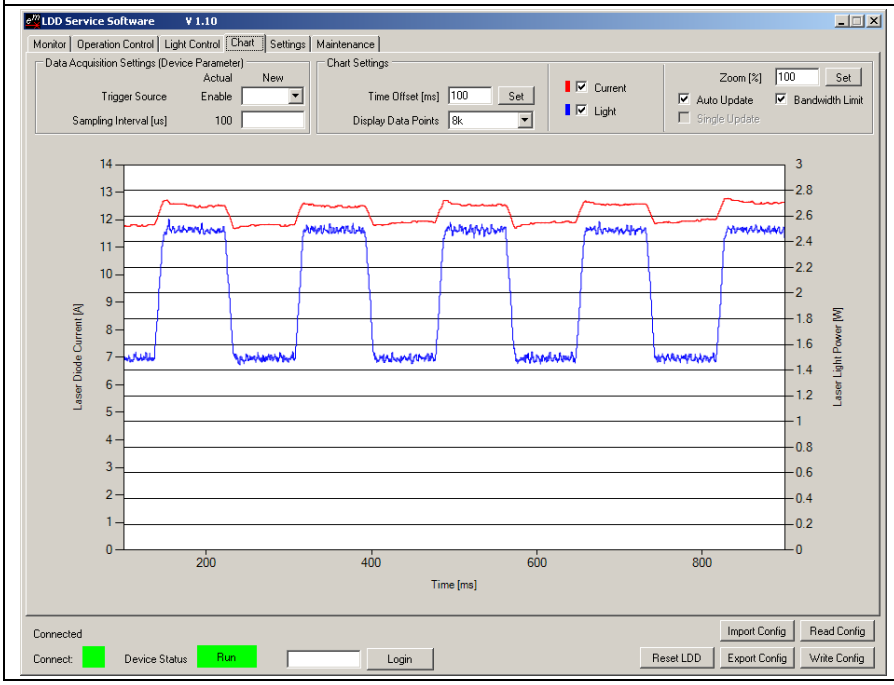
The LDD-1124-LPC is a laser power controller that is based on the LDD-1124, with additional light measurement circuitry (photodiode input). A user-defined 'Light System Scale' factor links the generated photocurrent to the absolute light power. The light PID controller's output is fed to the current controllers input. The nominal light power value may be CW, modulated CW (using internal generation) or remotely controlled. A configurable soft-start feature is available, as well.

Light Measurement Characteristics [Devices with LPC Option only]

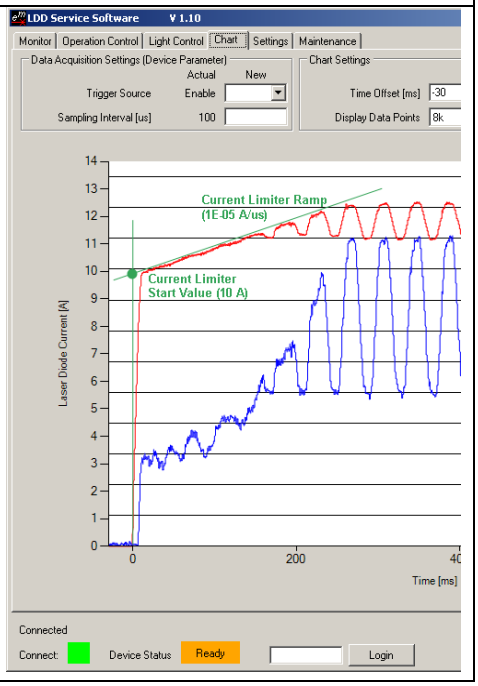
Unless otherwise noted: T_A = 25°C, V_{IN} = 24 V, V_{BIAS} = -3.3 V

Symbol	Parameter	Comments	Min	Typ	Max	Units
Photodiode Input Characteristics:						
I_{PD}	Photodiode current				4	mA
f_{ADC_LPC}	Sampling frequency	@ 16bit		0.5		MSps

Typical LPC Waveforms (Example from LDD-1121-SV)



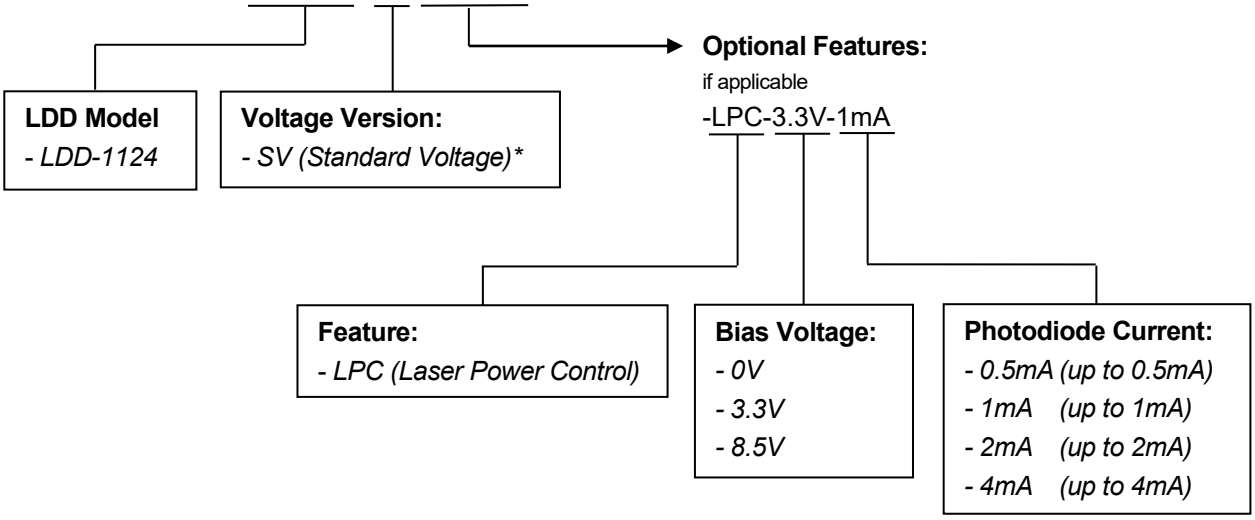
Laser Power Control (blue) and Diode Current (red).



LPC Soft-Start Limitation (green)

LDD-1124 Ordering Information, Hardware Configuration

Example Configuration: **LDD-1124-SV[-Options]**



* Standard Version (Stock Item)

Further customization can include digital lines for control, and diagnosis and communication protocol. Please contact Meerstetter Engineering GmbH with your inquiry.

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