

### PLD-PS

## SHORT PULSE LASER DIODE DRIVER



#### Key Features

- Special Design for 10/14 pin Butterfly Laser Diode
- Output current up to 2000 mA
- Compliance voltage up to 3 V
- Extra short 50 ps pulse width
- Repetition rate up to 30 MHz
- External trigger option
- USB, RS-232, CAN, UART interfaces
- LabView and Python libraries
- On-Board TEC Controller
- 5Vdc Input Power
- Integrated heatsink
- Compact size 85 × 60 × 21 mm

## PLD-PS RS232 Protocol Description

### RS232 configuration

Baud rate	57 600 baud/sec
Data bits	8 bit
Parity	no parity
Stop bits	1 bit

### Command format description

Command and response is a text string that has the following structure:

<Message header><data><crc16><CR> ... 100 milliseconds timeout ...

*Where:*

- Message header is “t0018” for command and “t0228” for response
- Data – is a packet of Ascii characters with hexadecimal values; For example, “01000000fffefdc”. Numbers of characters must be equal to 16 (8 pairs of characters).
- Crc16 – checksum value represented by 4 Ascii characters.
- <CR> – carriage return byte

**NOTE:** 100 milliseconds timeout between commands is necessary to provide stable device work.

### Data format description

<cmd><id><res><res><value\_4><value\_3><value\_2><value\_1><CRC\_2><CRC\_1>

*Where:*

- <cmd> – set/get command byte (HEX) or response byte (HEX)
- <id> – device ID if response data, if command – “00”
- <res> – reserved byte (HEX)
- <value\_4> – value byte 4 (HEX)
- <value\_3> – value byte 3 (HEX)
- <value\_2> – value byte 2 (HEX)
- <value\_1> – value byte 1 (HEX)
- <CRC\_2> – checksum byte 2 (HEX)
- <CRC\_1> – checksum byte 1 (HEX)

### CRC16 description

The MODBUS algorithm is used to calculate the packet checksum.

### CRC16 algorithm parameters

Poly	0x8005
Init	0xffff
Reflect In	true
Reflect Out	true
XorOut	0xffff

**CRC16 example:**

"t0028a122000000000000088f9\r"

**Where:**

0x88f9 is a checksum for packet ("t0028a122000000000000")

**NOTE:** If the command does not contain any checksum characters ("t0028a122000000000000\r") command will be executed without check.

**Response description**

Most of the commands has two types. The SET type and GET type. GET type forms from SET type <cmd> byte plus 0x80. For example, if SET type <cmd>=0x10, then same GET type <cmd+0x80>=0x90.

If device received SET command type <cmd>, it will send ACK response with the same <cmd> byte with empty value bytes.

If device received GET command type <cmd+0x80>, it will send ACK response with the same <cmd+0x80> with corresponding value bytes.

**Command description**

**1. Laser temperature command**

<cmd> = 0x12 SET command byte

<value\_4><value\_3><value\_2><value\_1> - temperature value bytes multiplied with 10;

**Example:**

Set laser current 25,2°C command

(value = 25,2\*10 = 252 = 0x000000FC):

"t00181200000000000000FC\r" - SET command

"t02281201000000000000CF9\r" - ACK response

Get laser temperature command:

"t00189200000000000000\r" - GET command

"t022892010000000000FC4F99\r" - ACK response with value 0xFC

Value 0x000000FC (252) is multiplied with 10, so the result value is 252/10 = 25,2°C.

**2. Thermistor beta command**

<cmd> = 0x15 SET command byte

<value\_4><value\_3><value\_2><value\_1> - thermistor beta value bytes;

**Example:**

Set thermistor beta 3984 (0x0F90) command

"t0018150000000000000F90\r" - SET command

"t02281501000000000000EBE\r" - ACK response

Get thermistor beta value command:

"t00189500000000000000\r" - GET command

"t022895010000000000F90425E\r" - ACK response with value 0x0F90;

**3. Thermistor resistance command**

<cmd> = 0x16 SET command byte

<value\_4><value\_3><value\_2><value\_1> - thermistor resistance at 25°C value bytes;

**Example:**

Set thermistor resistance 10000 Ohm (0x2710) command

"t001816000000000002710\r" - SET command

"t02281601000000000000FFD\r" - ACK response

Get thermistor resistance value command:

"t00189600000000000000\r" - GET command

"t02289601000000002710204B\r" - ACK response with value 0x2710;

#### 4. Laser voltage command

<cmd> = 0x18 SET command byte

<value\_4><value\_3><value\_2><value\_1> - laser voltage value bytes multiplied with 10;

##### Example:

Set laser voltage 17 V command  
(value =  $17 \cdot 10 = 170 = 0x00004E20$ ):

“t0018180000000000AA\r” - SET command

“t022818010000000000B73\r” - ACK response

Get laser voltage value command:

“t001898000000000000\r” - GET command

“t0228980100000000AAB990\r” - ACK response with value 0xAA;

**NOTE:** Value 0x000000AA (170) is multiplied with 10, so the result value is  $170/10 = 17$  V.

#### 5. Output frequency for internal generation command

<cmd> = 0x19 SET command byte

<value\_4><value\_3><value\_2><value\_1> - output frequency value bytes;

**Note:** the frequency should be set in increments corresponding to the following ranges

- 1 Hz increment for frequencies from range 1...1000 Hz
- 1000 Hz increment for frequencies from range 1kHz ... 1MHz
- 100000 Hz increment for frequencies from range 1MHz ... 30MHz

##### Example:

Set frequency value 20.1 MH command  
(value =  $20100000 = 0x0132B3A0$ ):

“t0018190000000132B3A0\r” - SET command

“t022819010000000000BB2\r” - ACK response

Get frequency value command:

“t001899000000000000\r” - GET command

“t0228990100000132B3AD613\r” - ACK response with value 0x0132B3A0;

**NOTE:** Value 0x0132B3A0 (20100000), so the result value is 20100000 Hz.

#### 6. Laser diode voltage on/off command

<cmd> = 0x20 SET command byte

<value\_1> = 0x00 to turn laser diode voltage off

<value\_1> = 0x01 to turn laser diode voltage on

##### Example:

Turn on laser diode voltage command:

“t0018200000000000001\r” - SET command

“t022820010000000000FC3B\r” - ACK response

Get on/off laser diode voltage state command:

“t0018A0000000000000\r” - GET command

“t0228A00100000000001299F\r” - ACK response with value 1;

## 7. TEC on/off command

TEC on/off command works only if laser diode has TEC.

<cmd> = 0x21 SET command byte

<value\_1> = 0x00 to turn TEC off

<value\_1> = 0x01 to turn TEC on

### Example:

Turn on TEC command:

“t00182100000000000001\r” - SET command

“t02282101000000000000FCFA\r” - ACK response

Get on/off TEC state command:

“t0018A100000000000000\r” - GET command

“t0228A101000000000001295E\r” - ACK response with value 1;

## 8. On/off laser pulse emitting command

<cmd> = 0x22 SET command byte

<value\_1> = 0x00 to turn laser pulse emitting off

<value\_1> = 0x01 to turn laser pulse emitting on

### Example:

Turn on laser pulse emitting command command:

“t00182200000000000001\r” - SET command

“t02282201000000000000FDB9\r” - ACK response

Get on/off laser pulse emitting command state command:

“t0018A200000000000000\r” - GET command

“t0228A201000000000001281D\r” - ACK response with value 1;

## 9. Mode command

<cmd> = 0x24 SET command byte

<value\_1> = 0x00 Internal generation

<value\_1> = 0x01 Pulse on demand mode

<value\_1> = 0x02 External generation mode

### Example:

Set pulse on demand mode command:

“t00182400000000000001\r” - SET command

“t02282401000000000000FF3F\r” - ACK response

Get mode command:

“t0018A400000000000000\r” - GET command

“t0228A4010000000000012A9B\r” - ACK response with value 1 – Pulse on demand mode;

### 10. Maximum voltage command

<cmd> = 0x25 SET command byte

<value\_4><value\_3><value\_2><value\_1> - maximum voltage value bytes multiplied with 10;

**Example:**

Set laser maximum voltage 30 V command

(value =  $30 \cdot 10 = 300 = 0x0000012C$ ):

“t0018250000000000012C\r” - SET command

“t02282501000000000000FFFE\r” - ACK response

Get maximum laser voltage value command:

“t0018A500000000000000\r” - GET command

“t0228A50100000000012CAF8A\r” - ACK response with value 0x012C;

**NOTE:** Value 0x0000012C (300) is multiplied with 10, so the result value is  $300/10 = 30$  V.

### 11. Minimum voltage command

<cmd> = 0x26 SET command byte

<value\_4><value\_3><value\_2><value\_1> - minimum voltage value bytes multiplied with 10;

**Example:**

Set laser minimum voltage 2 V command

(value =  $2 \cdot 10 = 20 = 0x00000014$ ):

“t001826000000000000014\r” - SET command

“t02282601000000000000FEBD\r” - ACK response

Get minimum laser voltage value command:

“t0018A600000000000000\r” - GET command

“t0228A601000000000014B8D8\r” - ACK response with value 0x0014;

**NOTE:** Value 0x00000014 (20) is multiplied with 10, so the result value is  $20/10 = 2$  V.

### 12. Gated pulses for burst generation command

<cmd> = 0x34 SET command byte

<value\_4><value\_3><value\_2><value\_1> - count of gated value bytes;

**Example:**

Set 10 gated pulses (0x0A) command:

“t0018340000000000000A\r” - SET command

“t022834010000000000006FFE\r” - ACK response

Get gated pulses value command:

“t0018B400000000000000\r” - GET command

“t0228B4010000000000A3FDA\r” - ACK response with value 0x0A;

**NOTE:** Value 0x0000000A (10), so the result value is 10 gated pulses.

### 13. Blocked pulses for burst generation command

<cmd> = 0x35 SET command byte

<value\_4><value\_3><value\_2><value\_1> - count of blocked value bytes;

**Example:**

Set 15 blocked pulses (0x0A) command:

“t0018350000000000000A\r” - SET command

“t022835010000000000006F3F\r” - ACK response

Get blocked pulses value command:

“t0018B500000000000000\r” - GET command

“t0228B5010000000000FFD5A\r” - ACK response with value 0x0F;

**NOTE:** Value 0x0000000F (15), so the result value is 15 blocked pulses.

#### 14. Minimum temperature command

<cmd> = 0x36 SET command byte

<value\_4><value\_3><value\_2><value\_1> - minimum temperature value bytes multiplied with 10;

##### Example:

Set minimum temperature 20°C command

(value =  $20 \cdot 10 = 200 = 0x000000C8$ ):

“t00183600000000000000C8\r” - SET command

“t0228360100000000000006E7C\r” - ACK response

Get minimum temperature value command:

“t0018B600000000000000\r” - GET command

“t0228B6010000000000C8ECBC\r” - ACK response with value 0x00C8;

**NOTE:** Value 0x000000C8 (200) is multiplied with 10, so the result value is  $200/10 = 20^\circ\text{C}$ .

#### 15. Maximum temperature command

<cmd> = 0x37 SET command byte

<value\_4><value\_3><value\_2><value\_1> - maximum temperature value bytes multiplied with 10;

##### Example:

Set maximum temperature 50,5°C command

(value =  $50,5 \cdot 10 = 505 = 0x000001F9$ ):

“t00183700000000000001F9\r” - SET command

“t0228370100000000000006EBD\r” - ACK response

Get maximum temperature value command:

“t0018B7000000000000000\r” - GET command

“t0228B7010000000001F9BCEE\r” - ACK response with value 0x01F9;

**NOTE:** Value 0x000001F9 (505) is multiplied with 10, so the result value is  $505/10 = 50,5^\circ\text{C}$ .

#### 16. Coefficient P command

<cmd> = 0x44 SET command byte

<value\_4><value\_3><value\_2><value\_1> - coefficient P value bytes multiplied with 10000;

##### Example:

Set coefficient P 10000 command

(value =  $10000 \cdot 10000 = 100000000 = 0x05F5E100$ ):

“t001844000000005F5E100\r” - SET command

“t0228440100000000000005DBC\r” - ACK response

Get coefficient P value command:

“t0018C4000000000000000\r” - GET command

“t0228C401000005F5E1001102\r” - ACK response with value 0x05F5E100;

**NOTE:** Value 0x05F5E100 (100000000) is multiplied with 10000, so the result value is  $100000000/10000 = 10000$ .

#### 17. Coefficient I command

<cmd> = 0x45 SET command byte

<value\_4><value\_3><value\_2><value\_1> - coefficient I value bytes multiplied with 10000;

##### Example:

Set coefficient I 1000 command

(value =  $1000 \cdot 10000 = 10000000 = 0x989680$ ):

“t00184500000000989680\r” - SET command

“t0228450100000000000005D7D\r” - ACK response

Get coefficient I value command:

“t0018C5000000000000000\r” - GET command

“t0228C5010000009896808E1F\r” - ACK response with value 0x00989680;

**NOTE:** Value 0x00989680 (10000000) is multiplied with 10000, so the result value is  $10000000/10000 = 1000$ .

### 18. Coefficient D command

<cmd> = 0x46 SET command byte

<value\_4><value\_3><value\_2><value\_1> - coefficient D value bytes multiplied with 10000;

**Example:**

Set coefficient D 2000 command

(value = 2000\*10000 = 20000000 = 0x01312D00):

“t00184600000001312D00\r” - SET command

“t022846010000000000005C3E\r” - ACK response

Get coefficient D value command:

“t0018C600000000000000\r” - GET command

“t0228C601000001312D001B35\r” - ACK response with value 0x01312D00;

**NOTE:** Value 0x01312D00 (20000000) is multiplied with 10000, so the result value is 20000000/10000 = 2000.

### 19. Device type command

<cmd> = 0xD0 GET command byte

**Example:**

Set device type PLD-PS command

Get device type command:

“t0018D000000000000000\r” - GET command

“t0228D00100000000014E99D\r” - ACK response with value 0x14

**NOTE:** Value 0x00000014 (20), so device type is PLD-PS.

### 20. CAN identifier command

<cmd> = 0x51 SET command byte

<value\_4><value\_3><value\_2><value\_1> - bytes of CAN ID value;

**Example:**

Command to set base ID using BROADCAST ID

(value = 0x01):

“t00185100000000000001\r” - SET command

“t02285101000000000000CEB8\r” - ACK response

Get CAN ID command:

“t0018D100000000000000\r” - GET command

“t0228D101000000000017A9D\r” - ACK response with value 0x01.

### 21. Save parameters command

<cmd> = 0x52 SET command byte

**Example:**

Command to save parameters in FLASH memory

“t00185200000000000000\r” - SET command

“t02285201000000000000CFFB\r” - ACK response