

## Data Sheet

### Description

The 4-pin MOST Optical Transmitter (ODIN MPT4 02) is a highly integrated CMOS IC combined with a high speed LED designed to transmit up to 25 Mbit/s optical data which is biphase coded (up to 50 Mbaud). The internal peaking circuit minimizes PWD. The current through the LED will be setup by an external resistor connected to VCC. This makes it possible to control the optical output power of the LED. The power supply voltage is either 3.3V or 5.0V. The power down mode switches the part into a low power mode if electrical data is not received.

### Applications

- Optical Transmitter for MOST Systems

### Features

Excellent solution for converting high speed data from TTL to Plastic Optical Fiber (POF)

- Operating @ 3.3V or 5V Power Supply
- High speed transmitter up to 25 Mbit/s net data rate (50 Mbaud)
- 95°C operating temperature over whole life time
- TTL Data Input (Logic to Light Function)
- Power down mode
- Duty Cycle Adjust (DCA), yields to enhanced SP1 input range
- 650 nm for working in a low attenuation range of PMMA Fiber
- High coupled power in 1000 micron plastic fiber
- Fully compliant to "MOST® Specification of Physical Layer Rev 1.1"
- RoHS compliant (Lead free and halogen free)

### Safety Hints

Applications of new chip technologies lead to increasing optical efficiency and growing and higher levels of optical performance. We therefore recommend that the current versions of the IEC 60825-1 and EN 60825-1 standards are taken into account right from the outset, i.e. at the equipment development stage, and that suitable protection facilities are provided.

**Table 1. Absolute Maximum Ratings**

| Parameter                                                      | Symbol      | Limit Values |                |       |
|----------------------------------------------------------------|-------------|--------------|----------------|-------|
|                                                                |             | min.         | max            | Unit. |
| Supply Voltage                                                 | $V_{CCMax}$ | -0.5         | 6.0            | V     |
| Storage Temperature Range                                      | $T_{STG}$   | -40          | 100            | °C    |
| Soldering Temperature (>2.5 mm from case bottom $t \leq 10s$ ) | $T_S$       | –            | 260            | °C    |
| Voltage at any PIN                                             |             | -0.5         | $V_{CC} + 0.5$ | V     |
| Electrostatic Discharge Voltage Capability <sup>[1]</sup>      | ESD         | –            | 2.0            | kV    |

Notes:

1. ESD Capability for all Pins HBM (human body model) according JESD22-A114B.

**Table 2. Recommended Operating Conditions**

| Parameter                                            | Symbol      | Limit Values |       |      |
|------------------------------------------------------|-------------|--------------|-------|------|
|                                                      |             | min.         | max.  | Unit |
| Supply Voltage low                                   | $V_{CC\_l}$ | 3.135        | 3.465 | V    |
| Supply Voltage high                                  | $V_{CC\_h}$ | 4.75         | 5.25  | V    |
| Operating Temperature Range (ambient) <sup>[1]</sup> | $T_A$       | -40          | 95    | °C   |

Notes:

1. For details see application note “Handling, Storage, Operating and Processing Application Note of ODIN MOST4 Transceiver”

All the data in this specification refers to the operating conditions above and over life time unless otherwise stated.

**Table 3. DC Characteristics**

| Parameter                                                                           | Symbol    | Limit Values |      |                | Unit       |
|-------------------------------------------------------------------------------------|-----------|--------------|------|----------------|------------|
|                                                                                     |           | min.         | typ. | max.           |            |
| Low Level Input Voltage                                                             | $V_{IL}$  | -0.3         | –    | 0.8            | V          |
| High Level Input Voltage                                                            | $V_{IH}$  | 2.0          | –    | $V_{CC} + 0.3$ | V          |
| Input Leakage Current ( $V_{CC} = 5.0V$ , $V_I = 0.0V$ or $V_I = 5.0V$ )            | $I_L$     | –            | –    | $\pm 20$       | $\mu A$    |
| Input Capacitance                                                                   | $C_I$     | –            | –    | 7              | pF         |
| Input Resistance                                                                    | $R_I$     | 2            | –    | –              | k $\Omega$ |
| Supply Current ( $R_{ext} = 15k\Omega$ ) ON state, biphas coded data <sup>[1]</sup> | $I_{CC}$  | –            | –    | 35             | mA         |
| Supply Current ( $R_{ext} = 15k\Omega$ ) OFF state <sup>[2]</sup>                   | $I_{LP2}$ | –            | –    | 20             | $\mu A$    |

Notes:

1. The current through the LED and therefore the optical output power and overall power consumption depends on the settings of  $R_{ext}$ . The nominal value for  $R_{ext}$  is 15 k $\Omega$ . With  $R_{ext} = 30k\Omega$  the optical output power is about -3 dB of the nominal value. Typical behavior see Figure 1.  
**Important: The external resistor of  $R_{ext}$  must be within the range of 13.5 k $\Omega$  to 33 k $\Omega$ . For values of  $R_{ext}$  out of this range functionality may not be given over the whole temperature range and the device lifetime. Using values below 13 k $\Omega$  for  $R_{ext}$  can damage the transmitter.**
2. If the transmitter is in full power mode it is switched OFF 1 ms (max.) after TX DATA is low. If the transmitter is in low power mode it is switched ON 6 ms (max.) after TX DATA transmission starts.

### Attention

Stresses above those listed here may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. Between 3.465V and 4.75V the device is not specified according Table2. Therefore operation is limited to the range of 3.135V ... 3.465V or 4.75V ... 5.25V.

**Table 4.1 AC Electrical Characteristics 45Mbaud (44.1kHz)**

| Parameter           | Symbol          | Limit Values |       |      | Unit | Test Conditions   |
|---------------------|-----------------|--------------|-------|------|------|-------------------|
|                     |                 | min.         | typ.  | max. |      |                   |
| Power Up Time       | T <sub>PU</sub> | —            | 0.016 | 6    | ms   | Zero -->MOST      |
| DataPower Down Time | T <sub>PD</sub> | —            | 0.01  | 1.0  | ms   | MOST Data -->Zero |

**Optical Signal Characteristics**(22.5 Mbit MOST Data, V<sub>CC</sub> = 3.135 ... 3.465 V or 4.75 ... 5.25 V, R<sub>ext</sub> = 15 kOhm)

| Parameter                                                                                                                                 | Symbol                                | Limit Values |      |      | Unit |
|-------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|--------------|------|------|------|
|                                                                                                                                           |                                       | min.         | typ. | max. |      |
| Peak wavelength                                                                                                                           | $\lambda_{Peak}$                      | 630          | 650  | 685  | nm   |
| Temperature coefficient $\lambda_{Peak}$                                                                                                  | TC <sub><math>\lambda</math></sub>    | —            | 0.16 | —    | nm/K |
| Spectral bandwidth (FWHM)                                                                                                                 | Delta <sub><math>\lambda</math></sub> | —            | 20   | 30   | nm   |
| Average Output Power coupled into plastic fiber <sup>[1]</sup>                                                                            | P <sub>opt</sub>                      | -9.0         | -5.2 | -2.0 | dBm  |
| Average Output Power coupled into plastic fiber<br>(if R <sub>ext</sub> = 13.5k is used instead of R <sub>ext</sub> = 15k) <sup>[1]</sup> | P <sub>opt</sub>                      | -8.5         | -4.7 | -1.5 | dBm  |
| Optical Output Power "Light off" <sup>[2]</sup>                                                                                           | P <sub>off</sub>                      | —            | —    | -50  | dBm  |
| Optical Rise Time (20% - 80%) <sup>[4]</sup>                                                                                              | t <sub>r</sub>                        | —            | 2.5  | 6    | ns   |
| Optical Fall Time (20% - 80%) <sup>[4]</sup>                                                                                              | t <sub>f</sub>                        | —            | 3.5  | 6    | ns   |
| Extinction Ratio <sup>[4][6]</sup>                                                                                                        | r <sub>e</sub>                        | 10           | 12   | —    | dB   |
| Pulse Width Variation <sup>[3][4][5]</sup>                                                                                                | t <sub>pWV</sub>                      | 20.0         | —    | 24.3 | ns   |
| Average Pulse Width Distortion <sup>[3][4]</sup>                                                                                          | t <sub>APWD</sub>                     | -1.4         | —    | 1.4  | ns   |
| Data Dependent Link Jitter <sup>[3][4]</sup>                                                                                              | t <sub>DDJ</sub>                      | —            | 0.20 | 0.77 | ns   |
| Uncorrelated Link Jitter <sup>[3][4]</sup>                                                                                                | t <sub>UJ</sub>                       | —            | 0.05 | 0.33 | ns   |
| Positive Overshoot within 0UI...2/3UI <sup>[4][6]</sup>                                                                                   |                                       | -20          | —    | 40   | %    |
| Negative Overshoot within -1UI...-1/4UI <sup>[4][6]</sup>                                                                                 |                                       | -10          | —    | 20   | %    |
| High Level Signal Ripple between 2/3UI and 3/4UI <sup>[4][6]</sup>                                                                        |                                       | -10          | —    | 10   | %    |

**Notes:**

1. Average value, when transmitting modulated light @ signal timing paramters. The output power coupled into plastic fiber P<sub>opt</sub> is measured with a large area detector at the end of 30 cm POF fiber with a NA = 0.5, which is ideally coupled to the transmitter.
2. Average value, when signal on Tx\_Data is low.
3. The electrical input signal has to fulfill following requirements: t<sub>pWV(min)</sub> = 20.1 ns, t<sub>pWV(max)</sub> = 24.1 ns, t<sub>APWD(min)</sub> = -1.5 ns and t<sub>APWD(max)</sub> = 1.5 ns, t<sub>DDJ(max)</sub> = 0.22 ns, t<sub>UJ(max)</sub> = 0.10 ns.
4. Characterized with Avago Characterization Boards as described in the Application note "Application Note MOST circuit for Avago ODIN Transceiver".
5. Limits for 2UI are 42.2 ... 46.4ns and for 3UI they are 64.3 ... 68.5ns.
6. Top and Base level measured at least over 10UIs.

**Table 4.2 Electrical Characteristics 49.152MBaud (48kHz)**

| Parameter           | Symbol          | Limit Values |       |      | Unit | Test Conditions   |
|---------------------|-----------------|--------------|-------|------|------|-------------------|
|                     |                 | min.         | typ.  | max. |      |                   |
| Power Up Time       | T <sub>PU</sub> | –            | 0.016 | 6    | ms   | Zero -->MOST      |
| DataPower Down Time | T <sub>PD</sub> | –            | 0.01  | 1.0  | ms   | MOST Data -->Zero |

**Optical Signal Characteristics**

(24.576 Mbit MOST Data, V<sub>CC</sub> = 3.135 ... 3.465 V or 4.75 ... 5.25 V, R<sub>ext</sub> = 15 kOhm)

| Parameter                                                                                                                                 | Symbol                                | Limit Values |      |      | Unit |
|-------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|--------------|------|------|------|
|                                                                                                                                           |                                       | min.         | typ. | max. |      |
| Peak wavelength                                                                                                                           | $\lambda_{\text{Peak}}$               | 630          | 650  | 685  | nm   |
| Temperature coefficient $\lambda_{\text{Peak}}$                                                                                           | TC <sub><math>\lambda</math></sub>    | –            | 0.16 | –    | nm/K |
| Spectral bandwidth (FWHM)                                                                                                                 | Delta <sub><math>\lambda</math></sub> | –            | 20   | 30   | nm   |
| Average Output Power coupled into plastic fiber <sup>[1]</sup>                                                                            | P <sub>opt</sub>                      | -9.0         | -5.2 | -2.0 | dBm  |
| Average Output Power coupled into plastic fiber<br>(if R <sub>ext</sub> = 13.5k is used instead of R <sub>ext</sub> = 15k) <sup>[1]</sup> | P <sub>opt</sub>                      | -8.5         | -4.7 | -1.5 | dBm  |
| Optical Output Power "Light off" <sup>[2]</sup>                                                                                           | P <sub>off</sub>                      | –            | –    | -50  | dBm  |
| Optical Rise Time (20% - 80%) <sup>[4]</sup>                                                                                              | t <sub>r</sub>                        | –            | 2.5  | 5.5  | ns   |
| Optical Fall Time (20% - 80%) <sup>[4]</sup>                                                                                              | t <sub>f</sub>                        | –            | 3.5  | 5.5  | ns   |
| Extinction Ratio <sup>[4][6]</sup>                                                                                                        | r <sub>e</sub>                        | 10           | 12   | –    | dB   |
| Pulse Width Variation <sup>[3][4][5]</sup>                                                                                                | t <sub>pWV</sub>                      | 18.4         | –    | 22.3 | ns   |
| Average Pulse Width Distortion <sup>[3][4]</sup>                                                                                          | t <sub>APWD</sub>                     | -1.3         | –    | 1.3  | ns   |
| Data Dependent Link Jitter <sup>[3][4]</sup>                                                                                              | t <sub>DDJ</sub>                      | –            | 0.20 | 0.71 | ns   |
| Uncorrelated Link Jitter <sup>[3][4]</sup>                                                                                                | t <sub>UJ</sub>                       | –            | 0.05 | 0.31 | ns   |
| Positive Overshoot within 0UI...2/3UI <sup>[4][6]</sup>                                                                                   |                                       | -20          | –    | 40   | %    |
| Negative Overshoot within -1UI...-1/4UI <sup>[4][6]</sup>                                                                                 |                                       | -10          | –    | 20   | %    |
| High Level Signal Ripple between 2/3UI and 3/4UI <sup>[4][6]</sup>                                                                        |                                       | -10          | –    | 10   | %    |

**Notes:**

1. Average value, when transmitting modulated light @ signal timing paramters. The output power coupled into plastic fiber P<sub>opt</sub> is measured with a large area detector at the end of 30 cm POF fiber with a NA = 0.5, which is ideally coupled to the transmitter.
2. Average value, when signal on Tx\_Data is low.
3. The electrical input signal has to fulfill following requirements: t<sub>pWV(min)</sub> = 18.4ns t<sub>pWV(max)</sub> = 22.3ns, t<sub>APWD(min)</sub> = -1.3ns and t<sub>APWD(max)</sub> = 1.3ns, t<sub>DDJ(max)</sub> = 0.20ns and t<sub>UJ</sub> = 0.09ns.
4. Characterized with Avago Characterization Boards as described in the Application note "Application Note MOST circuit for Avago ODIN Transceiver".
5. Limits for 2UI are 38.72 ... 42.66ns and for 3UI are 59.06 ... 63.01ns.
6. Top and Base level measured at least over 10UIs.

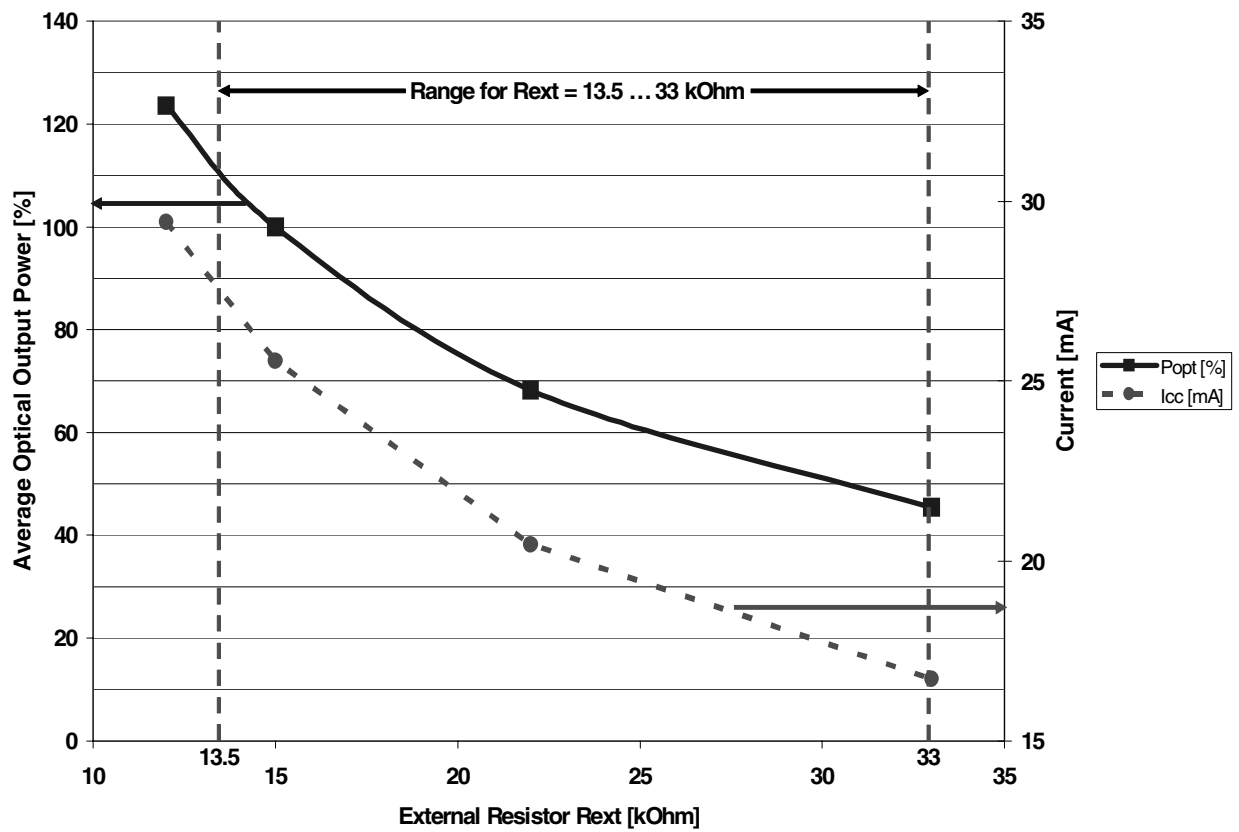
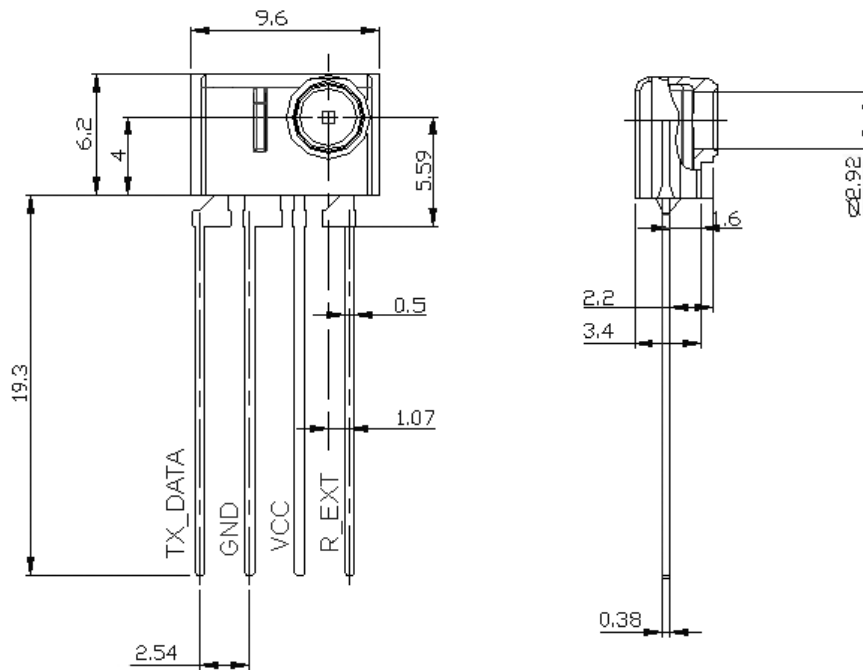


Figure 1. Typical Dependency of Average Optical Output Power  $P_{opt}$  and Supply Current versus External Resistor  $R_{ext}$  (22.5 Mbit MOST Data,  $V_{CC} = 5.0$  V,  $T_A = 25$  °C)

## Package Outlines

ODIN MPT4 02(Cavity as Interface Package)



Dimensions in mm

For a more detailed drawing please contact Avago Technologies.

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## Revision History

|                   |                                              |
|-------------------|----------------------------------------------|
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| Page              | Subjects (major changes since last revision) |
| 3, 4              | Rounding of numbers                          |
| 7                 | Addition of "Revision History"               |

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