

April 2004



### Features

- 850 nm oxide confined VCSEL
- Power monitored
- Data rate up to 3.1 Gbps
- High fibre coupling efficiency
- Optical field stable over temperature and current

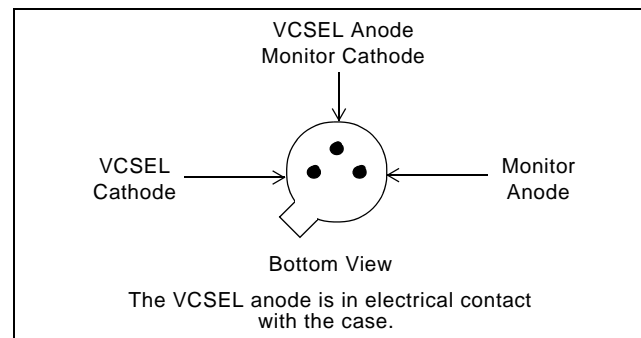
### Applications

- High speed Data Communication and Telecommunication
- Gigabit Ethernet / InfiniBand / FibreChannel / ATM

### Ordering Information

ZL60002/TBD TO-46 with lens

-0°C to +70°C



**Figure 1 - Pin Diagram**

### Description

The ZL60002 is a high speed TO-46 assembled 850 nm VCSEL (Vertical Cavity Surface-Emitting Laser).

The product converts electrical current into optical power to be used for fibre optic communications.

The device incorporates a photodiode which monitor the optical power by producing a current proportional to the output power which allow for feedback control.

The ZL60002 has a narrow beam divergence which is stable over temperature and current. This give rise to high and stable fibre coupling efficiency without any additional lenses.



**WARNING: Laser Radiation, avoid exposure to beam. Class 3B laser product, potential eye hazard. Warning labels in each box**

**Absolute Maximum Ratings**

| Parameter   | Symbol    | Min. | Typ. | Max. | Unit |
|---|-----------|------|------|------|------|
| Storage Temperature                               | $T_S$     | -40  |      | +100 | °C   |
| Operating Temperature (case)                      | $T_O$     | 0    |      | +70  | °C   |
| Continuous Forward Current (f<10 kHz)             | $I_F$     |      |      | 15   | mA   |
| Reverse Voltage                                   | $V_R$     |      |      | 5    | V    |
| Soldering Temperature (2 mm from case for 10 sec) | $T_{sld}$ |      |      | 260  | °C   |

**VCSEL Thermal Characteristics**

| Parameter                                | Symbol          | Min. | Typ. | Max. | Unit  |
|--|-----------------|------|------|------|-------|
| Thermal Resistance – Infinite Heat Sink  | $R_{thjc}$      |      | 1000 |      | °C/W  |
| Thermal Resistance – No Heat Sink        | $R_{thja}$      |      | 1300 |      | °C/W  |
| Temp. Coefficient - Wavelength           | $d\lambda/dT_j$ |      | 0.06 |      | nm/°C |
| Optical Power – Variation (0 – 70°C)     | $\Delta P_O$    |      | ±0.3 |      | %/°C  |
| Threshold Current – Variation (0 – 70°C) | $\Delta I_{th}$ |      | ±0.6 |      | mA    |

**Electro-Optical Characteristics<sup>†</sup>**

| Parameter  | Symbol             | Min. | Typ. | Max. | Unit     | Test Condition                |
|--|--------------------|------|------|------|----------|-------------------------------|
| Fiber-Coupled Power (50/125 $\mu\text{m}$ fibre) | $P_{\text{fibre}}$ | 0.5  |      |      | mW       | $I_F = 7 \text{ mA}$          |
| Optical Power                                    | $P_O$              |      |      | 1.3  | mW       | $I_F = 7 \text{ mA}$          |
| Threshold Current (0 – 70°C)                     | $I_{th}$           | 1    |      | 4.5  | mA       |                               |
| Forward Voltage                                  | $V_F$              | 1.6  |      | 2.2  | V        | $I_F = 7 \text{ mA}$          |
| Centre wavelength                                | $\lambda_C$        | 830  | 850  | 860  | nm       | $I_F = 7 \text{ mA}$          |
| RMS Spectral Width                               | $\Delta\lambda$    |      |      | 0.85 | nm       | $I_F = 7 \text{ mA}$          |
| Differential resistance                          | $R_{\text{diff}}$  |      |      | 50   | $\Omega$ | $I_F = 7 \text{ mA}$          |
| Relative Intensity Noise                         | RIN                |      |      | -120 | dB/Hz    | $I_F = 7 \text{ mA}$ , Note 1 |
| Optical Rise Time (20%-80%)                      | $t_r$              |      | 80   | 130  | ps       | Note 2                        |
| Optical Fall Time (20%-80%)                      | $t_f$              |      | 100  | 140  | ps       | Note 2                        |
| Beam divergence ( $1/e^2$ )                      | q                  | 5    |      | 15   | °        | Note 3                        |

<sup>†</sup> At 25°C case temperature unless otherwise stated.

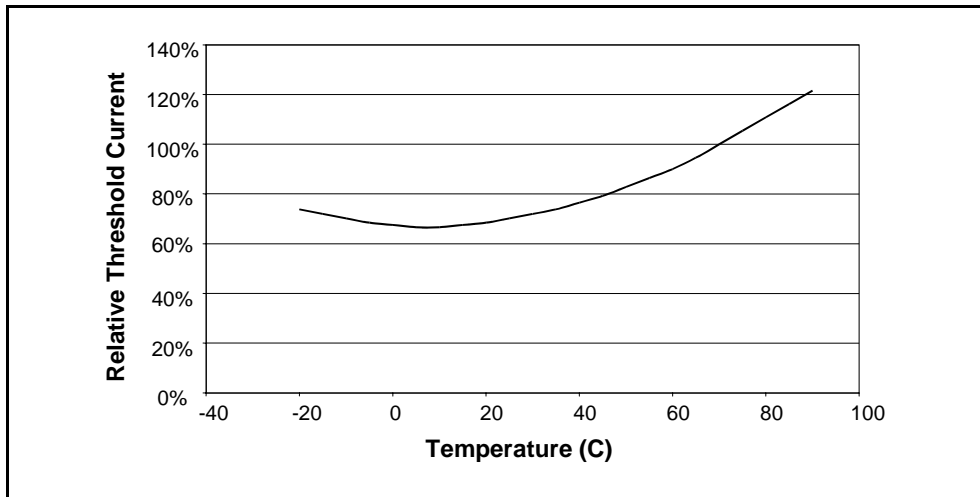
Note 1: ANSI X3.230-1994

Note 2: InfiniBand sec. 8.5.3.2

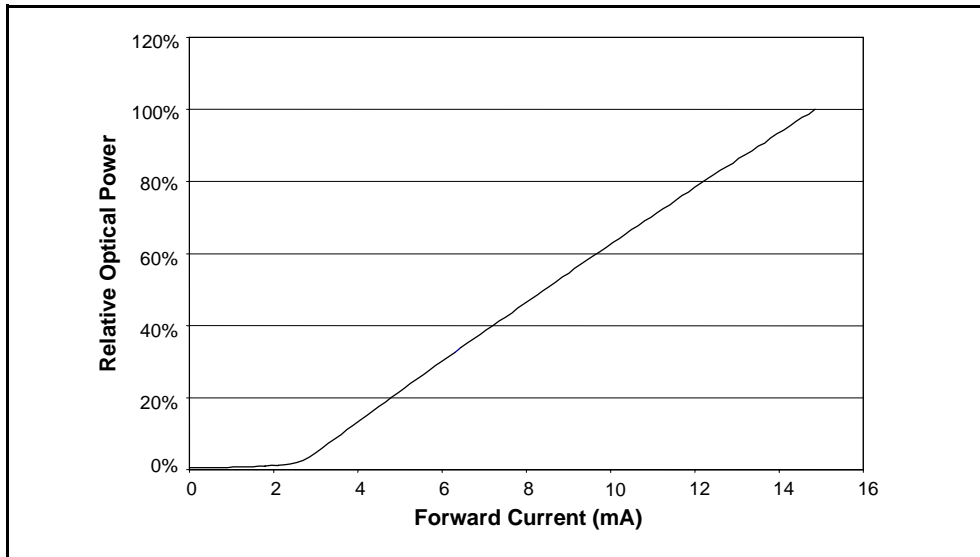
Note 3: Over operating current and bias over threshold

**Monitor Diode Characteristics**

| Photodiode Parameters                 | Symbol       | Min. | Typ. | Max. | Unit | Test Condition                     |
|---------------------------------------|--------------|------|------|------|------|------------------------------------|
| Monitor Current                       | $I_{PD}$     | 0.1  |      | 1    | mA   | $P_{couple} = 0.5 \text{ mW}$      |
| Monitor Current Temperature variation | $dI_{PD}/dT$ |      |      | 0.3  | %/°C | $P_{couple} = 0.5 \text{ mW}$      |
| Dark Current                          | $I_D$        |      |      | 20   | nA   | $V_R = 3 \text{ V}$                |
| Capacitance                           | C            |      | 15   |      | pF   | $V_R = 3 \text{ V}$ , Freq = 1 MHz |



**Figure 2 - Threshold Current over Temperature**



**Figure 3 - Optical Power vs Forward Current**

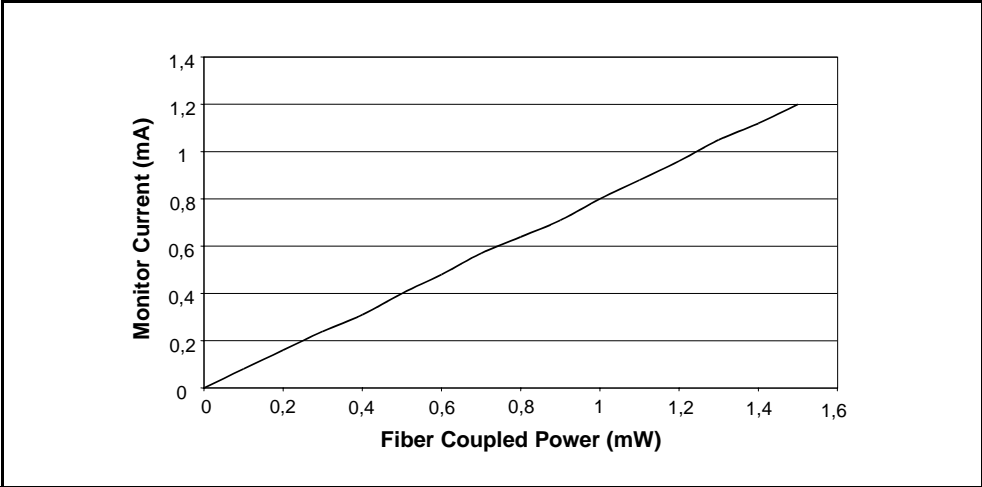
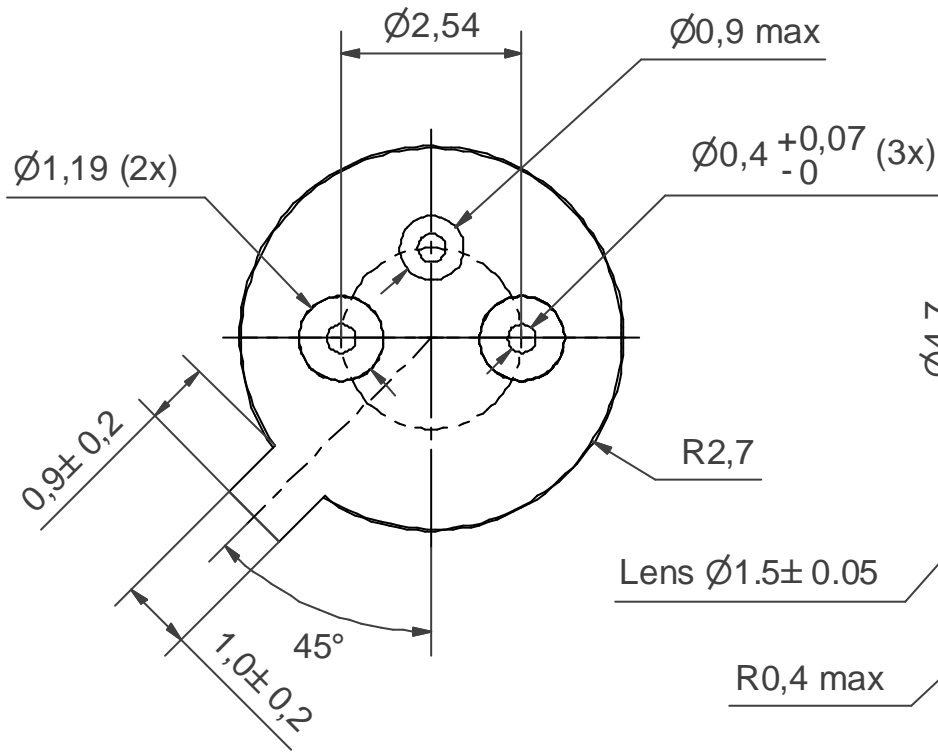
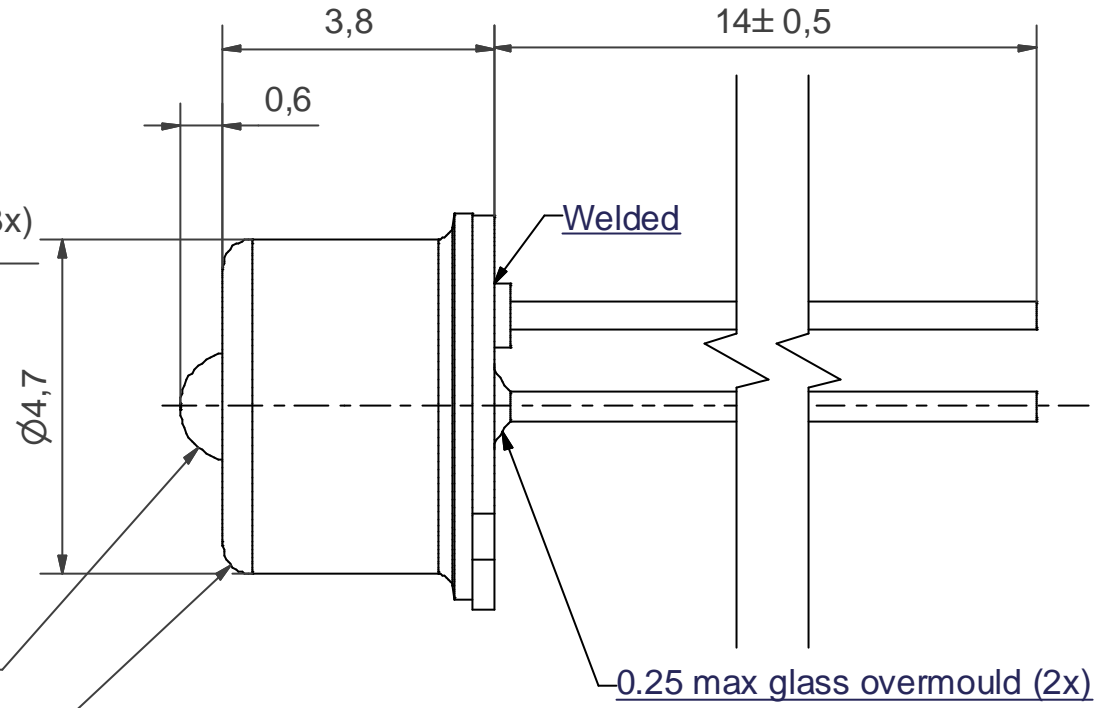


Figure 4 - Monitor Current vs Fiber Coupled Power

# BOTTOM VIEW ( 10 : 1 )



# SIDE VIEW



### NOTES:-

1. All dimensions in mm.
2. General tol. ISO-2768-mK.
3. Coating: Case: Ni 1,5-2,5 µm.  
Header: Ni min 0,5 µm / Au min 1,5 µm.

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|                        |  |
|------------------------|--|
|                        | Package code <b>TB</b>                           |
| Previous package codes | Drawing type<br>Package drawing, TO-46 with lens |
|                        | Title <b>JS004077</b>                            |



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