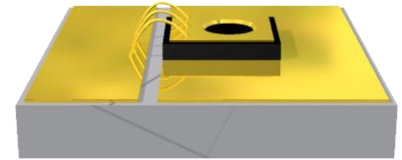
# LASER DIODE SUB-MOUNT DESIGN GUIDELINES

ELECTRO - PHOTONICS
WAVES INTO THE FUTURE

REV. 1.00

Electro-Photonics offers submounts for photo diode and laser applications built to customer specifications. A laser die is normally mounted on a submount with similar CTE to prevent mechanical stress due to thermal expansion. To minimize the thermal effects and hence prevent damage to the laser, the submount material is chosen to have the proper thermal conductivity to dissipate the heat the laser generates. In consequence, the submount acts as a heat spreader. This submount can be further mounted onto a heat sink such as pure copper or copper-tungsten for increased thermal dissipation.



Refer to the tables below for design guidance. Please contact factory for special materials and/or custom metallization scheme. A DXF or DWG file format will be needed in order to provide a quote. Please send your files for RFQ to sales@electro-photonics.com.

**TABLE 1: SELECTION**

| FEATURE | SPECIFICATION |
|---|---|
| **SUBSTRATES** | Aluminum Nitride<br>Beryllium Oxide<br>CVD Diamond |
| **METALLIZATION** | Ti / Pt / Au<br>Pre-deposited Solder (Sn, AuSn)<br>TaN Resist 50 and 100 Ohm/sq (±1%) |
| **FEATURES** | 0.0025 in. lines and space (± 0.0005 in.)<br>Thru-Hole and Wrap-Around capabilities |
| **SIZE** | .020 x .020 in. Area<br>.005, .010, .015, and .025 in. Thicknesses (±10% standard, ±5% premium tolerance)<br>0.0005 Camber |

**TABLE 2: MATERIAL PROPERTIES**

| PROPERTY | ALUMINUM NITRIDE | BERYLLIUM OXIDE | CVD DIAMOND |
|---|---|---|---|
| **THERMAL CONDUCTIVITY** | 170 W/mK * | 270 W/mK | 1000 W/mK |
| **DIELECTRIC CONSTANT** | 8.6 @ 1MHz | 6.5 @ 1MHz | 5.7 |
| **DISSIPATION FACTOR** | 0.001 @ 1MHz | 0.0004 @ 1MHz | 0.0001 @ 1MHz |
| **ELECTRICAL RESISTIVITY** | >$10^{14}$ Ωcm | >$10^{14}$ Ωcm | >$10^{14}$ Ωcm |
| **THERMAL COEFFICIENT OF EXPANSION** | $4.6 \times 10^{-6}$ (25 – 300°C) | $9.0 \times 10^{-6}$ (25 – 1000°C) | $1.0 \times 10^{-6}$ (25 – 300°C) |
| **POLISHED SURFACE FINISH** | <2 µ-in | <4 µ-in | <19.7 µ-in |
| **DENSITY** | 3.28 g/cm³ | 2.85 g/cm³ | 3.515 g/cm³ |

* Special 190 W/mK and 230 W/mK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