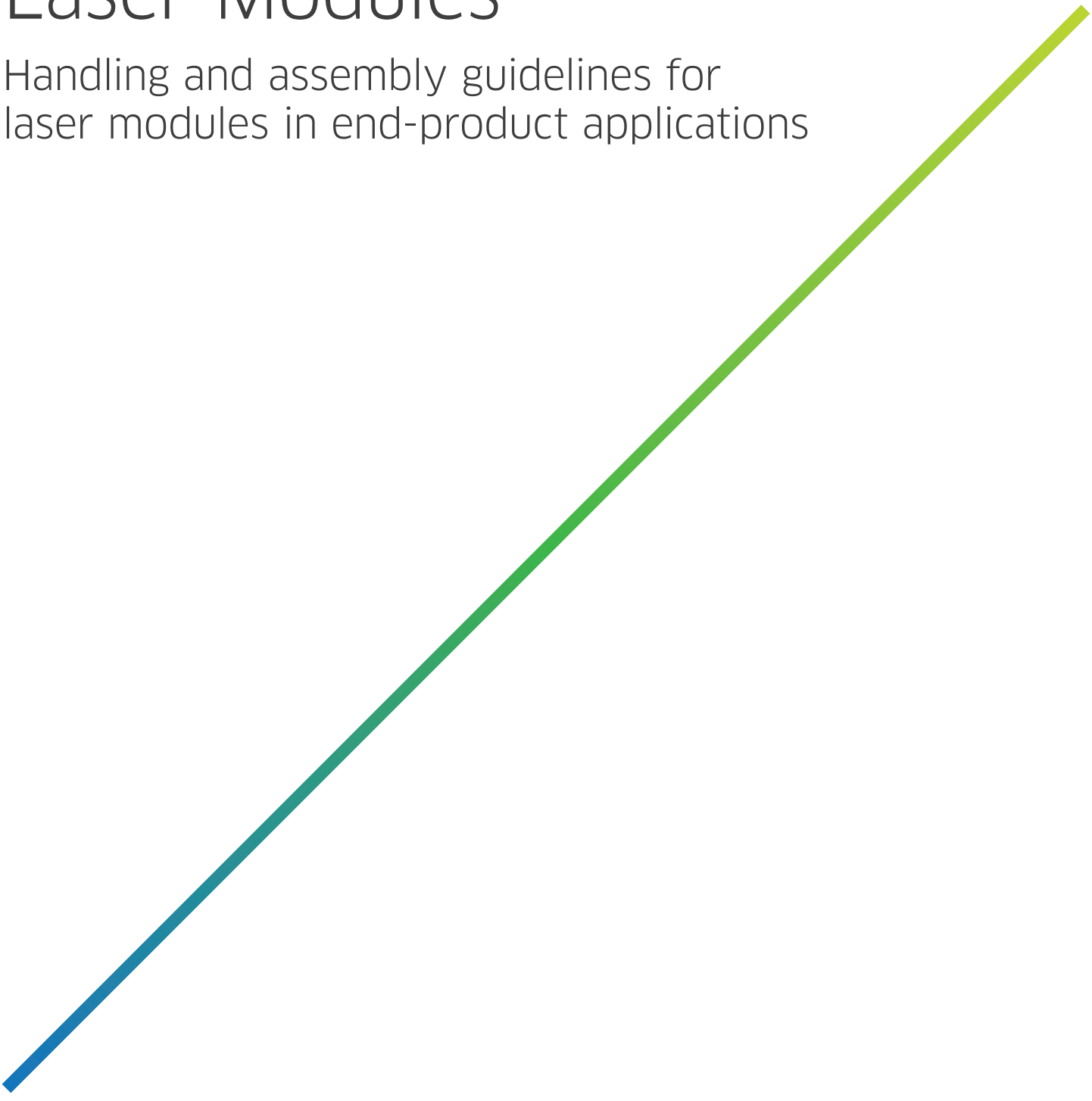
LUMENTUM

Chip-on-Submount Laser Modules

Handling and assembly guidelines for laser modules in end-product applications



Introduction

The chip-on-submount (CoS) architecture has become a popular package style for diode laser modules. Manufacturers of laser products that contain an embedded CoS laser module should be aware that the handling and assembly methods that they use when mounting the CoS module on their board affect the reliability and lifetime of the laser system.

While Lumentum guarantees the performance characteristics of a stand-alone CoS module as shipped to the customer, no Lumentum warranty applies to the methods and processes that the customer uses to attach the module to the end product.

It is therefore important for the customer to take account of the best practices recommended by Lumentum for handling and assembling CoS laser modules on their board. By following these practices, the customer can optimize the performance and quality of its end product.

Customers must confirm the final reliability and quality of any system using a CoS by testing that system. They should not rely solely on reliability and quality data provided by Lumentum for the CoS module alone.

This application note reviews the handling and assembly factors that can affect the performance, quality and reliability of a CoS diode laser module in a customer's application. Factors that can impair a CoS laser module's quality, and reliability are:

- Damage caused by pick-and-place operations
- Electrostatic discharge (ESD) strikes
- Interconnect defects
- Attachment materials
- Contamination
- Exposure to cleaning chemicals and cleaning processes.

This application note provides recommended practices intended to reduce the risk of impairment and to optimize the performance and reliability of the CoS module when assembled in an end product.

Pick-and-place operations

A CoS module is typically shipped in either a customized waffle pack or a Gel-Pak®.

The Lumentum recommendation is to perform device pick up with an automatic pick-and-place machine. If the use of automatic equipment is not possible and manual pick-up is required, the operator should use a rounded-head tweezer under a low-power microscope. Particular care must be taken to avoid touching wires.

The specifications of the pick-up operation must be precisely defined. The outer diameter of the pick-up collet must be limited to a maximum of 0.25 mm (10 mils). The pick-and-place machine should provide placement accuracy of ±25 µm maximum.

The size of the collet diameter is crucial to the prevention of damage to wires and the diode laser during the pick-and-place process in a high-volume manufacturing environment (see Figure 1).

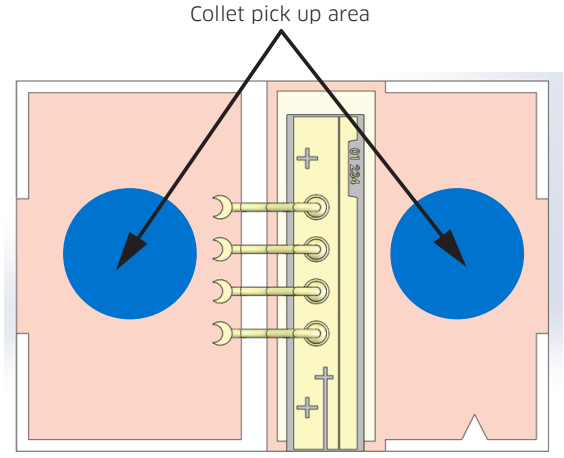


Figure 1: Each collet pick-up area highlighted in blue should have a maximum diameter of 0.25 mm

Preventing ESD strikes

CoS modules must be handled in an ESD-safe clean room.

The Lumentum recommended guidelines for preventing ESD damage to CoS modules are:

- Ensure operators, equipment, work-in-process (WIP) transport trays, work surfaces, and systems are grounded to eliminate static electricity
- Use only confirmed ESD-dissipative coatings or surface finishes on fixtures or tools used to assemble the CoS module
- Remove sources of static from the working area, or control the voltages that they generate to a level below the specified maximum for safe ESD handling
- Install air ionizers as necessary for additional environmental control
- Use electrostatic shielding containers and anti-static or dissipative carriers.

Correct interconnection and attachment

The recommended method for forming the second-level connection between a CoS module and the customer's board is with round or ribbon wire bonding (see Figure 2). Wire bonding is preferred to soldering as it avoids the risk of contamination.

Thermally-conductive epoxy (EMS DA-5990 or equivalent) is recommended for attaching the CoS module to a heatsink: this provides for good heat flow between interfaces.

Enclosure or similar protection is required to prevent contaminants from landing on facets during the epoxy curing process.

Process operating conditions are limited to a maximum of 220°C for 60 seconds.

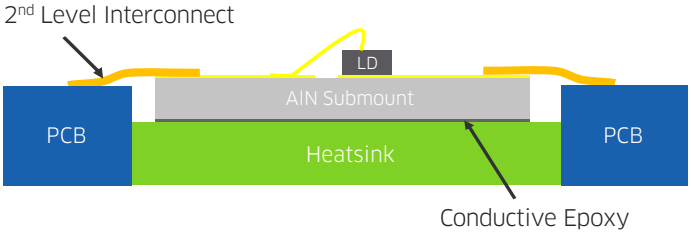


Figure 2: Bond wires are recommended for the interconnection between CoS and PCB

Preventing contamination and chemical exposure
There is a risk of impairing the reliability of the laser module if either the diode or facets are exposed to energetic or ionic surface cleaning methods, such as plasma. The same applies to exposure to condensation created by atmospheric moisture or solvents.

To reduce the risk of condensation, the enclosure in which the CoS module is packaged should be non-condensing, and vented to ensure that the atmosphere in the enclosure achieves a rapid equilibrium with the ambient atmosphere.

Conclusion
By following closely the guidelines above, users of a Lumentum CoS module can avoid impairing the COS module's quality by use of inappropriate assembly, connection, or other production processes.

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