VCSELs at a Glance

Dr. Vincent D. Mattera, Jr
President and CEO II-VI

375 Saxonburg Blvd., Saxonburg, PA 16056-9499, info@ii-vi.com

Keywords: VCSEL

Vertical Cavity Surface Emitting Lasers (VCSELs) initially addressed niche applications such as gas sensing and atomic clocks. VCSELs found their first high volume application in fiber-optic communications for enterprise and datacenter networks, by cost effectively extending transmission reach beyond the capabilities of copper cables. Later, VCSEL-based systems replaced the familiar rolling ball mechanism in the computer mouse to improve tracking precision, making VCSELs ubiquitous in a consumer electronics application for the first time.

Today we are witnessing the exploding demand for VCSELs driven by 3D sensing for face biometrics in recent models of smartphones and tablets to unlock them at a glance. That demand is expected to further accelerate driven by a growing number of 3D sensing applications in automotive and consumer electronics.

For example, in automotive applications, 3D sensing can enhance a vehicle's capability to sense its occupants, to monitor the driver's alertness or to accept commands based on gesture recognition. In the event of a collision, 3D sensors can help provide critical information about the position and attention of occupants to activate restraints and deploy airbags in the best possible manner.

Augmented reality in consumer electronics is enabled by 3D depth sensors that can scan our environment consistently to create 3-dimensional digital representations in real time. High power VCSELs can be used as illumination sources for time-of-flight, structured light and active stereoscopic systems. Lasers provide a more reliable, robust and more precise 3D mapping by illuminating target scenes consistently in a wide range of ambient light conditions. A diverse range of industries including metrology, health care, real estate and retail are making significant investments in augmented reality to enhance customer engagement and define new business models.

It is expected that as new requirements emerge, VCSELs will continue to provide unique functionality in new communication and sensing applications in the form of miniaturized, high power and low power consumption laser sources that can be integrated with optics and electronics in application-specific modules that differentiate consumer and automotive products.