



AN-12 MONITOR PHOTODIODES IN WINDOW PACKAGES

With high-power multimode lasers, care must be used when designing a system that relies on the signal from the monitor photodiode. This is particularly true in window-type seal packages.

The photodiode in a laser diode package receives a portion of the laser light that leaks from the back facet. In addition, the photodiode also receives light that reflects off the inside of the package window (or microlens or fiber, if equipped). These light components are not always consistent or predictable, so the size of the photodiode signal can vary widely from one package or laser type to another, or even within a single package type. Facet coating reflectivity can vary from one production lot to another, and the reflected light signals can change dramatically according to lens or fiber alignment.

Furthermore, the photodiode will also respond to any light reflected back through the window into the laser package. If external optical elements or objects in the optical path reflect any laser light back into the diode package, that light can also hit the monitor photodiode, giving a false indication that the laser power has changed. Only in certain situations are such external back-reflections completely stable. Thus, the monitor photodiode often cannot provide a reliable indication of laser diode output power.

In addition, the photodiode only samples a small portion of the laser wavefront. In a multimode laser diode, the wavefront is irregular, consisting of many overlapping modes that form an interference pattern. This interference pattern power distribution typically shifts with changes in operating current, temperature, or time. Therefore, the amount of light received by the monitor photodiode could change even if the total diode output power remains unchanged.

The monitor photodiode itself also has its own sensitivity to both temperature and wavelength. So changes in package temperature (which affect the laser wavelength) could affect the monitor photodiode signal.

The monitor photodiode should be employed only with great care and relied upon only after extensive testing in the particular situation. In most cases, it cannot be used to provide a reliable power measurement, but it can serve as an "on-off" indicator to confirm whether the diode is energized. It is usually best to perform true power monitoring using a carefully chosen reflection from an optical element or beamsplitter in the external optical setup, selected to be stable and independent of back reflections.