

Optoelectronic Devices Packaging

Optoelectronic Light Sources

Optoelectronic light sources require packaging that protects the chip and allows light through to the chip². Window lens designs can be tailored to provide higher response on the optical axis of the lens, greater directional sensitivity, and a larger aperture (with less resolution). In commercial devices, the lens is usually an integral part of the package and tight controls of optical tolerances are somewhat compromised in order to optimize protection of the chip with a hermetic seal. Devices with integral lenses tend to exhibit response variations that are significantly greater than those without integral lenses. Devices without integral lenses are recommended for applications requiring quality, external optics, high gain, and highly directional optical systems. Light source package designs are either plastic or hermetic, and are available with or without a lens. The optical axis is typically perpendicular to the leads in plastic packages but is parallel to the leads in hermetic packages. The hermetic package is more robust than plastic in providing protection in harsh environments and although normally more expensive, can nevertheless be cost effective.

Optical Fiber

Optical fiber is typically wrapped in a protective coating (cable) which is available in a number of fiber-optic cable configurations. MIL-PRF-85045 is an excellent guideline for the selection of an appropriate fiber optic cable.

Optical Connectors

Optical connectors provide a mechanical coupling mechanism that minimizes optical loss through a path within a fiber optic link from source to detector. A high degree of tolerance control associated with fiber optic connectors tends to allow a small amount of misalignment between two fibers being joined at a junction. Optical connectors today offer insertion losses in the range of 0.3 to 0.5 dB, which is below the 0.75 dB allowed by network standards. To provide mechanical security and optical alignment, connectors contain a ferrule, which secures and aligns the fiber. Stainless steel ferrules offer higher durability than ferrules made of ceramics or polymers, because of steel's rugged physical characteristics. Connectors designed to meet the requirements of military specification MIL-C-83522 are ideally suited for aircraft, shipboard, and land-based applications. The connector types of most interest in fiber optic link applications are either a ST or SC style:

ST style connectors utilize a quick release bayonet style plug, which requires only a half turn for mating. The unique construction design of the ST connector makes it less sensitive to cable movement and prevents accidental disengagement. ST connectors can be designed for single-mode or multi-mode light duty tactical military applications.

SC connectors employ a push pull mechanism for mating and are a popular design for many less severe applications.

Detectors

Detector packages for both photodiodes and phototransistors are designed to allow light onto the light sensitive region of the chip. Phototransistors are typically assembled in transparent packages. The manufacturer's data sheets are useful for determining the appropriate package configuration.

Optocouplers

Optocouplers are packaged for either commercial or high reliability applications. The commercial devices are normally available in plastic, dual in-line packages (PEM /DIP). When applications require a higher reliability than can be obtained with a plastic encapsulated package, hermetically sealed optocoupler package designs are typically available as DIPs or metal cans (TO... Series).

²"Optoelectronics", W. H. Sahm, General Electric Company, Syracuse, N.Y.