Reflective Assemblies—Design considerations for single-sided sensing applications

Application Bulletin 204

General Discussion

A reflective assembly generally consists of a single emitter and sensor in the same housing. This provides a major mounting advantage because optical access to the surface to be sensed is required from only one side. However, this can lead to a wide variety of design variables involving mounting configurations, reflective surface, and sensing circuits.

Designers are often faced with conditions that prevent reflective assemblies from being used as specified by the manufacturer. Reflective surfaces may be different than specified, or the gap between the assembly and the reflective surface may be greater or less than specified and/or cannot be consistently maintained. The mounting requirements may make tight control impractical and/or the "contrast ratio" may have to be improved.

Optek offers several reflective assemblies providing the designer with alternative solutions to these problems.

Performance Characteristics

Optek makes two types of reflective assemblies; focused and unfocused.

A. **Focused Reflective Assemblies**

The focused version is made from discrete devices with convex lenses. Figure 1 shows three versions of this configuration. (Discrete devices are internal to the housing and are not shown.)

Figure 1 – Focused Reflective Assemblies

In this device type, the on-state collector current, $I_{C[ON]}$, peaks when a reflective surface is placed 0.100" to 0.200" (2.5 to 5.0 mm) in front of the assembly.

$I_{C[ON]}$ is the collector current created from the reflected infrared radiation emitted from the LED and detected by the sensor from a reflective surface. $I_{C[ON]}$, maximum is 75% of the distance to the intersection of the optical axes of the LED and photosensor. In other words, discretes focused to a reflective surface at a distance from the housing of .200" would have an approximate peak $I_{C[ON]}$, at .150". This is due to the emitted radiation following a diverging pattern rather than a straight line through its center line and the sensor viewing a converging pattern rather than a straight line through its center. The angular mountings of the discretes are ideal for detecting the presence of a polished or specular surface.

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B. Unfocused Reflective Assemblies

Figure 2

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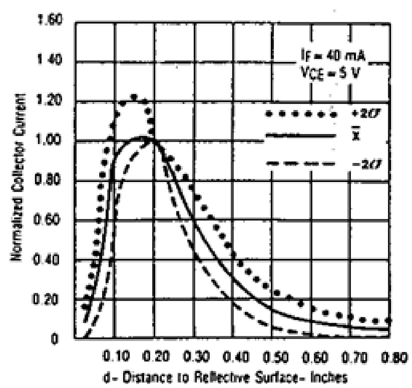
The unfocused version is made from discrete devices with plano or non-magnifying lenses. Figure 2 shows two versions of this configuration.

In this type of device the $I_{C[ON]}$ peaks when a reflective surface is placed 0.050" to 0.080" (1.25 to 2.00 mm) in front of the assembly. The units are designed for mounting in sockets or printed circuit boards.
Plano lenses make unfocused assemblies ideal for detecting the presence of diffuse surfaces.

Figure 3 shows variation in output versus distance from a given reflective surface for both focused and unfocused devices.

Figure 3 - Normalized Collector Current vs. Distance to Reflective Surface



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