Light Matters

Designing illumination systems with high-brightness LEDs

Chip-on-Board (CoB) LEDs are one of the fastest-growing categories of LEDs for general lighting products. Sometimes the innovative technology in a new LED family is not based on advanced physics or phosphor—it's an improved LED die packaging concept. CoB type LEDs are an excellent example of this.

I would broadly define two general classes of high-brightness white LED applications; those that require a small, intense LED source, and those that benefit from a larger light-emitting area (such as an array of closely-packed LEDs). Each configuration has its place.

Flashlights, spotlights, and products that couple light into fiber optics work best when the LED has a small active emitting area. The small light emission surface significantly reduces the size of the required secondary focusing lenses and collimation optics, simplifies their design, and yields a more efficient optical system.

On the other hand, floodlights, room/ceiling/area/outdoor lighting and high bay lights often work best when the LED has a larger emitting area. Typically this is done by using an array of die or discrete mid-power LEDs. Large emitting area LEDs/arrays reduce glare, "hot spots" (localized high-brightness areas) and have more relaxed thermal requirements (since their excess heat is spread across a larger area as well).

Most CoBs today have tens or hundreds of tiny LED die connected together in a series/parallel arrangement, mounted onto a small ceramic or metalized carrier board, and covered with a layer of phosphor.

Figure 1—A large CoB LED from Citizen Electronics, available from Avnet

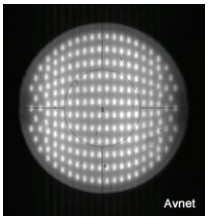

Figure 2—In this "X-Ray" image, you can see how the individual LED die are placed under the phosphor. It's the same CoB LED (Citizen CLL050) as in Figure 1.

TE Connectivity (previously known as Tyco Electronics) supplies several families of CoB "holders" for Citizen CoBs. After selecting the CoB needed based on desired light output (lumens), color temperature (warm white, cool white, etc.), color rendering (CRI) and power requirements, the CoB is placed in the holder, the holder mounts to a metal surface inside your product with two screws, and 2 wires are pushed in from the sides. The holder grabs the wires while also pressing the back of the CoB against the surface to optimize thermal conduction. No soldering is needed, so CoBs can be changed out quickly in the field or on the production floor to meet special end-customer requirements.

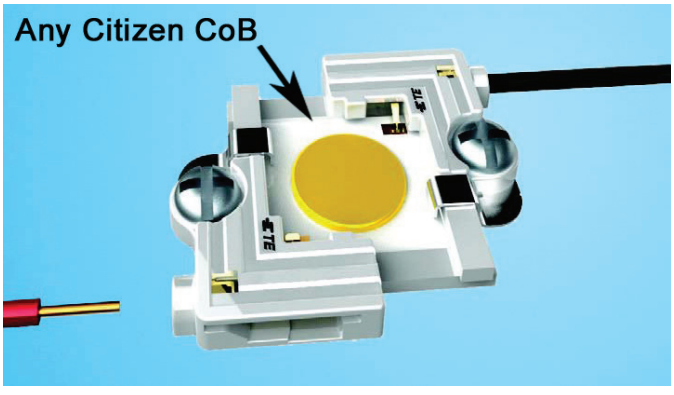

Figure 3—One of many TE Connectivity CoB solderless holders for Citizen LEDs

If you'd like to learn more, take a look at these two short YouTube videos I made using Citizen CoBs and the TE Connectivity holders. (Warning: do not operate heavy machinery after viewing. ☺)

http://www.youtube.com/watch?v=ruDSMYQDqvM

http://www.youtube.com/watch?v=1S6R4xepLrs

Of course, you're welcome to send me a note at **LightSpeed@Avnet.com** as well or speak with your local Avnet representative.

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To learn more about designing an LED-based illumination system, go to:

www.em.avnet.com/LightSpeed