



FAQ on Connected Lighting



ON Semiconductor®

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Introduction

Lighting at our workplace is one of those things we just take for granted. Yet, the quantity and quality of the lighting in most work environments such as office buildings, retail stores, and factories are critical parts of getting the job done. In addition, the cost of lighting, especially in a large facility, is a significant operating expense. Controlling the lighting is a great way to reduce electrical service expenses. Increasingly, organizations are paying more attention to the effectiveness of the lighting and its cost.

Getting control of the lighting in a commercial workspace is an example of an Internet of Things (IoT) application. When constructing a new facility or retrofitting an existing building, significant savings can be achieved by installing controlled LED lighting. Here are some critical questions engineers are asking about connected LED lighting.

What is the rationale behind using LED lighting in a commercial facility?

There is an ongoing trend to replace older fluorescent and incandescent lighting with LED lights, not only in homes but also in all commercial buildings. LEDs consume much less power per lumen (brightness) than all other legacy lighting. In a large facility, the result is considerable energy savings that greatly reduces costs. In addition, adding the ability to control all lighting at all locations locally and remotely can provide extra savings.

But that's not all. LEDs have a longer life than fluorescents or incandescent, up to 100,000 hours in some cases. That results in replacement savings. Furthermore, LEDs are electronic devices that are readily controlled with low-cost electronic equipment.

How is LED lighting controlled?

LEDs operate from DC voltage unlike traditional lighting that uses the AC power line voltage directly. Most LED light fixtures are simply turned off and on, but some others may have color control or a dimming feature that permits fine-tuning of the light level. The actual control signal to switch the DC power off or on can come from a conventional wall mounted switch or some remote-control equipment. The off-on-dim signal can be delivered by traditional AC wiring or by radio.

Building engineers have discovered that they can use the CAT5e or CAT6 unshielded twisted pair (UTP) wiring that is the backbone of the Ethernet LAN that most facilities deploy. The Power over Ethernet (PoE) option allows that cable to carry DC power in addition to the high-speed digital data signals.

Explain the use of Power over Ethernet (PoE) as it applies to connected lighting.

A few years ago, the IEEE Ethernet development group added PoE to the 802.3 standard. Designated 802.3af, the first version of PoE was designed to deliver up to 12.5 watts of power at 48 volts. The output of an AC-to-DC power supply is connected to an Ethernet port that sends the DC down the UTP cable to a remote device that needs power. It eliminates the need for a separate AC-DC power supply at the remote device that also happens to require an Ethernet connection.

Since its introduction, the PoE standard has been upgraded several times. Today, the latest standard is 802.3bt that permits loads of up to 90 watts. While this does not sound like enough to power lighting, keep in mind that LEDs use much less power to generate high lumen levels. This allows lighting to be powered anywhere an Ethernet connection exists.

How is the lighting controlled by wireless technology?

Since wireless control must cover an enormous area, some special considerations are in order. Most personal area wireless technologies have an effective range of 10s meters or so. Also, these low power signals must penetrate walls, ceilings, and other obstacles. One way to overcome this range limitation is to adopt a mesh network.

A mesh network spreads nodes across a wide area. Each node links to the nodes nearest to them. And these nodes link up with other more distant nodes. A mesh network covers a huge area as nodes relay control signals from one to the next. A mesh network is almost a must in lighting control. If an entire building is to be controlled, a mesh network is about the only topology that fits the application. New nodes are easily added or removed, making it possible to scale the network to accommodate growth or other changes.

What wireless technologies are available to control commercial lighting?

Two major wireless technologies offer mesh capability that is required to meet the expectations of commercial users. These are Bluetooth[®] Low Energy and ZigBee[®]. Both standards have been around for about 20+ years. The protocol incorporated the mesh into its initial standard and plenty of support is available to implement it.

Bluetooth Low Energy added mesh capability recently. Both standards work well and are proven short range wireless technologies. Hardware and software are available from multiple sources.

What products does ON Semiconductor offer to address the LED movement?

ON Semiconductor's new Connected Lighting Platform is a complete solution that addresses the needs of industrial LED lighting applications. The energy efficient platform supports up to two strings of 16 LEDs and a maximum brightness of 7000 Lumens. For design flexibility, the platform provides multiple options for powering and supports wireless and wired connectivity through modules for Bluetooth Low Energy and Power Over Ethernet (PoE). Based on the RSL10 System-in-Package (RSL10 SIP), the wireless connectivity module enables LED controls such as dimming, on/off and programming via the provided mobile applications. The platform also features environmental sensors to monitor the ambient conditions.

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