Enabling a Smart World Through Infrared Sensing

Whitepaper

by Solid State Supplies, Excelitas & TE

Contents

Foreword

Spurred on by continued technological advancement, the world today is more connected than ever. This presents a tremendous opportunity to build a more sustainable, healthy and prosperous future for all. The ecosystem in which connected devices operate allows for the automation of operations in the home and workplace by allowing each device to communicate with other similar devices. They are able to transmit useful sensor data to consumers, companies, and other intended recipients.

Essential sensors

Sensors are essential for keeping track of temperature, pressure, movement, light and a variety of other parameters, whether they are used in a portable health monitor, on a factory floor, or under the bonnet of a car. Additionally, sensors are gaining traction in emerging technologies like artificial intelligence and virtual reality. Sensors are key components in connected devices that recognise events or alterations in the environment and then produce the appropriate output.

Smart home and smart city revolution

Our homes and cities are becoming ever more intelligent. Sensors in smart home devices, for instance, are designed to detect and react to human presence. A person's car interacts with the garage to open the door when they get home. When they enter their house, the lighting is already tuned to a lower intensity and colour based on data from their smart watch, and the thermostat is already set to their chosen temperature.

Sensors have applications in almost every industry vertical, from consumer electronic products to automotive, industrial, IT and telecom. Smartphones, for example, incorporate a dizzying array of sensors including accelerometer, gyroscope, ambient light sensor, proximity sensor, and temperature detector to measure parameters and provide a centralised system for automatic control.

In this whitepaper, we examine trends and the drivers for growth in the infrared sensor market which include COVID-19 and the focus on sustainability. With input from Solid State Supplies' partners Excelitas Technologies and TE, we explore the impact infrared sensors are having on different markets including the health and wellbeing market, smart home market and street lighting market.

I would like to thank the spokespeople from Excelitas and TE for their valuable insight and contributions as well as Lorna Lawson and Jake Matthews from Solid State Supplies.

John Macmichael,
Divisional Managing Director, Solid State Supplies

Chapter 1

All About IR Sensors: Features & Applications

Infrared sensors are able to detect and quantify heat or temperature from the infrared radiation a warm body emits – literally by looking at the object in question.

There are two main applications most people are familiar with. The first is the detection of motion and presence from temperature changes within the field of view of the sensor. Automatic doors or water taps are application examples of this. The sensors used to switch lightbulbs on or set off intrusion alarms are based on the same principle.
The second is remote (non-contact) temperature measurement. Probably the best-known use case here is in-ear fever thermometers that also demonstrate the precision that can be reached using these sensors. Other examples of non-contact temperature sensing include the measurement of room temperature for climate control or the temperature of food in a microwave.

The pandemic has driven sales for both applications described above, with increased interest in smart home applications as well as health monitoring and screening due to concerns over COVID-19.

Active and passive IR sensors

Infrared sensors are divided into two categories: active infrared sensors (IR) and passive infrared sensors (PIR). Infrared radiation is emitted and detected by active infrared sensors, which consist of a light-emitting diode (LED) and a receiver. When an object approaches the sensor, the light emitted by the IR LED is reflected back and is detected by the receiver. Active infrared sensors are often utilised as proximity sensors in obstacle detection systems (such as those in robots).

Passive infrared (PIR) sensors do not emit infrared radiation; they simply detect it. Passive infrared sensors comprise:

- Two strips of pyroelectric material (a pyroelectric sensor)
- An infrared filter (that blocks out all other wavelengths of light)
- A fresnel lens (which collects light from many angles into a single point)
- A housing unit (to protect the sensor from other environmental variables, such as humidity)

PIR sensors are frequently used in motion-based

detection systems, such as home security systems. The difference in IR levels between the two pyroelectric elements is monitored, and when a moving object that emits infrared radiation approaches the sensing range of the detector, the sensor sends an electronic signal to an embedded computer, which sets off an alarm.

Two different types of PIR sensors

Pyrodetectors and thermopiles are two separate types of IR radiation sensors. They use different technology and are divided in terms of use cases: pyrodetectors for the detection of changes (e.g., motion detection), thermopiles for quantifying the heat flow (e.g., thermometers and presence detection).

Pyrodetectors are the most sensitive PIR sensors and use pyroelectric crystals. While these crystals emit large signals, they only react to changes in the radiation and temperature, in a similar way to piezo electrical materials reacting to change in mechanical strain. When combined with a multi-facet lens, this reaction can be used for motion detection. As the sensor is extremely sensitive, simple and inexpensive plastic Fresnel-lenses can be used.

Pyrodetectors are used for many motion and intrusion detection applications and Excelitas' sensors are easily able to detect humans over a range of more than 20m (depending on lens and application.)

The second type of PIR sensors are thermopile sensors. Here, micromachining (MEMS) is used to 'pile-up' hundreds of miniaturised thermocouples into an extremely sensitive temperature sensor that measures the temperature of an FIR (far infrared) absorbing sensor area. Exposed to a source of thermal radiation, the absorber will heat or cool according to the object's temperature which allows calculation of that temperature.

Thermopile sensors can be used for absolute temperature such as the temperature of a room or the food in a microwave. On microscopic level, a thermopile sensor is a group of thermometers linked together so heat flows can be detected very accurately.

There are totally digital pyroelectric infrared detectors available now which give a digital signal output, as well as smart versions of these sensors with entire motion electronics integration. Surface mount device (SMD) pyroelectric detectors are also available, allowing for high-volume, surface mount technology (SMT)-compatible production in essential motion and presence detecting applications including energy-saving motion-activated automatic light switches.

Application Examples

Passive IR sensors are suitable for a wide range of applications.

Fever Thermometers / Medical Applications

Thermopile sensors have been used since the late 1990s to accurately measure temperature in medical devices such as in-ear thermometers. FDA-approved models are using this technology.

Presence Detection / Home Appliances / Smart Home

The sensors used in automated doors, water taps and other common detection applications are generally pyroelectric sensors.

Very recently, the home automation market has benefitted from pyroelectric sensors being designed into intelligent doorbells and access controls where video cameras allow remote management of entrances for delivery personnel or visitors. We see thermopiles replacing or augmenting pyroelectric sensors, where a closer detection range and a steady-state presence detection are required.

Thermopiles are often used in microwave ovens to monitor the temperature of food being heated or defrosted.

Thermopiles are also used for early fire detection - for example by monitoring a stovetop. These sensors are not only able to determine critical temperatures that might be related to a fire, but also monitor temperature change and determine whether overheating is occurring. This gives people valuable seconds to cut power automatically from the overheating source.

This technology can be applied to the outdoors, from sensing hot temperature spots in the garden and triggering sprinklers at an earlier stage, before fire ignition, to creating a perimeter of temperature sensors around a property for wildfire detection. Pyroelectric sensors can also be used for flame detection by sensing the gas emissions from the flame at an earlier stage before it becomes out of control; this detection method can provide an earlier warning than smoke detection.

Climate Control / Home Automation / HVAC

PIR sensors are used as remote temperature sensors to monitor the environment in a room and then adjust or control heaters or air conditioners more accurately. Multi-pixel sensors are used to scan a room to detect presence and thereby determine whether there is currently a need for environmental control

Industrial Applications / Networked Industry / IoT

PIR sensors are found in automated process control applications where temperatures must be monitored, where moving parts are under surveillance or where hazardous conditions must be monitored. Common applications include fans and blowers, a laser printer’s fuser drum, power electronics such as EV charging stations and EV battery surveillance where the thermopile sensors detect heat-flow to calculate the object’s temperature.

Chapter 2

Impact of IR Sensors on the Smart Home & Healthcare Markets

Digital output enables low power consumption

Although sensors in applications such as intrusion alarms were traditionally based on an analogue circuit, the switch to digital output has been taking place over the last ten years. We are now seeing the third generation of digital parts which allows sleep mode and has a low power consumption operating at a supply voltage of 1.8 V. This is a real game-changer for the IoT market as it allows the use of a battery without relying on a mains supply which is driving a huge increase in volume and demand for sensors: outdoor cameras, hunting cameras, surveillance devices etc can all be operated with no connection needed. These can now be battery-operated devices with communication implemented internally via Bluetooth or Wi-Fi, to send signals to a mobile device or laptop – a huge advantage for the user.

Growth in demand for home surveillance devices

People who like exploring technology are often eager to have home surveillance devices and be able to monitor them remotely. Even doorbells can now communicate through Wi-Fi, Bluetooth and other communication protocols, with the spy camera informing the resident who is at their door – and the door can be answered virtually too. This market has big growth potential and Excelitas has increased its ratio of digital detectors to 70% with just 30% now analogue. Ten years ago, Excelitas launched its first digital sensors, and the company has witnessed year-on-year double-digit growth in demand for digital parts in preference to analogue sensors. In 2021, however, even analogue sensors saw an increase in demand.

Considerations for powering sensor devices

The battery life for devices usually depends on the set-up of the circuit and the signal threshold. It is critical that the user doesn't need to recharge or change batteries too frequently and therefore a reasonable battery life is expected. Ideally, the user would only be changing batteries once a year, but the use case, duty cycle of the device, trigger frequency, camera use and power consumption from night view (infrared diodes illuminate the scene) should all be taken into consideration. Power consumption will also be affected by the features included and the size of the unit. This is something that is determined by the OEM philosophy and go-to-market strategy.

"Presence detector activated light bulbs have been around for a long time but are also driving some new requirements like low power consumption, operation at lower voltage levels, and ease of integration for applications."

Impact of EU regulations on device power consumption

EU regulations aim to reduce EEE (electric and electronic equipment) power consumption and new legal requirements are really shaping the limits of power consumption for devices. One example is the vacuum cleaner which used to consume around 2.5kW but is now only allowed to consume 400W. Displays are a focus as many household devices have a display which doesn't need to be lit up and working constantly. Demand control can be used with such displays so that they only show information if someone is working with or approaching the device. A pyrodetector or thermopile sensor with short range presence detection can control the function of a device, triggering it from sleep mode to powered operation mode when required. Demand control can be applied to almost any kind of electrical equipment.

Traditional markets are driving new developments

Thermopiles are widely used for temperature measurement in the heating, ventilation and air conditioning (HVAC) market. Air conditioning units use thermopiles to acquire infrared imaging of a room and control the cooling or heating demand. You can also find thermopiles in some radiator controls. These markets are now driving the development of IoT-enabled devices and pushing us towards a more digital, more low power world.

"Traditional markets such as heating, ventilation and AC are now driving the development of IoT-enabled devices and pushing us towards a more digital, more low power world."

Challenges switching from analogue to digital technology

From an application support point of view, we find that there are companies still having difficulty switching from analogue to digital technology.
Another challenge for companies operating in the commercial motion detection/intrusion alarm market is that products undergo very few innovation cycles. This is because, as a supplier, obtaining third party certification acceptable by insurance companies is extremely costly. This is why a large part of the traditional safety and security market is still served by analogue detectors as change is slow due to the investment, certification and qualification needed in this market.

Unregulated markets benefitting from IR sensors

New markets like the smart and IoT markets are unregulated, and OEMs have free rein to design and innovate but should ensure they have a robust marketing strategy and use high quality components that perform well. One of the reasons that this market for semi-professional devices exists without certification and registration is because the devices are not needed for a private homeowner to obtain insurance on their property, unlike a commercial property.

Application challenges of IR sensors for design engineers

Pyrodetectors and thermopiles are both optical sensors using infrared, and designs typically combine a small camera, sensor and lenses. For motion detection, there is a huge variety of combinations and combining the right optical elements with the sensor can be a significant challenge for engineers who often need application support.

There can be complications with thermopile sensors as the sensors tend to be sensitive to their

environment. This can be compared to using a camera made of glass: the sensor itself sees a temperature signature of its environment and the thermal design has to be carefully managed to ensure sensor accuracy.

Fever screening was used in the early days of the pandemic to protect the public. Thermopiles are often used in in-ear thermometers and Excelitas has a large market share here. These devices need to be designed with great attention to detail to be medical grade. The increase in demand for thermometers during COVID-19 triggered interest in integrating this kind of functionality into mobile devices. Although this is possible from a design perspective, there needs to be further sensor development before this type of application could be realised in mobile phones. This technology could also be successfully integrated into health trackers or smart watches as health tracking is already very popular in the wake of the pandemic.

Challenges using IR sensors for body temperature measurement

A desire to track body temperature for health and fitness reasons could certainly impact the sensor market for healthcare trackers. However, your body temperature changes in different environments and also changes when you're asleep. You must always take measurements regularly and at the same time obtain accurate statistical evaluation. A smart watch could monitor this as the sensor could constantly take your wrist temperature, which could then be analysed along with other vital signs like heart rate.

> *"The health monitoring trend started before COVID-19 but the pandemic increased the sales of regular thermopiles and thermometers as demand for sensors increased. Medical and paramedical surveillance equipment is another potential growth area for IR sensors."*

Pulse affects body temperature and other vital signs so more than one sensor will be needed in any device. Clever data acquisition and analysis are also needed to draw conclusions. If a device can assess blood pressure, temperature, heart rate and oxygen saturation as well as take the room temperature, then this information could be analysed by an algorithm to draw conclusions on a person's health. In some cases, data could even be transferred to a medical professional so that the person could be under permanent medical surveillance yet remain at home.

The health monitoring trend started before COVID-19 but the pandemic increased the sales of regular thermopiles and thermometers in 2020 and 2021. This pushed the demand for sensors but we're now seeing normal levels of demand.

Growth in the medical markets

Medical and paramedical surveillance equipment is another potential growth area for IR sensors but development in this area also relies on analysis, calculation power and software for accuracy and interpretation. Data needs to be linked to medical records so that the output is useful information about the user. This trend has been accelerated due to COVID-19 and we're seeing a lot of interest in this application area. The market trend is towards reasonable costs now though. Previously, sensors and infrared cameras were highly sought after as shops and public venues were using medical surveillance cameras to measure forehead temperature to check whether people might have COVID-19.

Fred Plotz, *Product Manager - IR Sensing, Excelitas Technologies*
Lutz Rauscher, *Team Leader - Engineering, Excelitas Technologies*

Chapter 3

Revolutionising Street Lighting With IR Sensors

Trends driving the lighting sensors market

TE considers that sensors are the future for our organisation and we've made big acquisitions in this market. Whilst the number of connected devices is increasing, the number of connectors designed into applications is decreasing. Sustainability is going to be the major trend for the lighting market now and in the coming years, particularly with the spiralling energy costs we're seeing now. In the indoor lighting marketing, users are going to be more interested in how their building is going to be used and how the energy in that building is going to be used. In the outdoor lighting market, the pandemic may have caused a slowdown in the implementation of smart city programmes, but it has also caused a shift in the way towns and cities make priorities and pushed the agenda of projects with far-reaching benefits. Councils want to use their post-pandemic recovery plans to build back better and invest in long-term projects with sustainability and climate change as a goal. A shift to LED street lighting makes a strong first move.

> *"Sustainability is going to be the major trend for the lighting market now and in the coming years, particularly with the spiralling energy costs we're seeing now."*

Spotlight on sensors for the indoor lighting market

Sensors are ubiquitous in the indoor lighting market. Where lighting is installed in buildings – particularly office blocks, commercial and industrial buildings – then you will most likely find sensors in place for occupancy sensing and daylight sensing. This has been the case for many years and helps saves energy and money by automatically turning lights off when they are not needed, by reducing light levels when full brightness is not necessary, or otherwise controlling lighting in an indoor environment.

Effect of COVID-19 on the indoor lighting market

COVID-19 has hit the indoor lighting market heavily globally, due to the increase in people working from home. There has been a drop in sensor sales for office buildings in particular, as well as for commercial buildings and, to an extent, the retail space. Although sensors aren't typically used to the same extent in the retail space as they are in office buildings and the commercial space, the landscape of our high streets has certainly changed enormously over the last few years. The pandemic wasn't the only reason for a slowdown in the retail market but it certainly contributed. Many institutions in the retail market have not been quick enough to respond to the online market and the bricks to clicks movement. Customers that provide indoor lighting reported that throughout COVID-19, sales declined.

Focus on the outdoor lighting market: street lighting

We're used to seeing the yellow sodium lights on our streets but now we're seeing more white LEDs lighting up our streets too. This is a massive

> *"The future of street lighting is control through sensors. TE has been active in driving the market for street lighting and believes the future of this market is lighting controls."*

energy saving already but there are going to be government pressures on sustainability, especially in Europe, and that's going to mean further controls going on to streetlights as well.

The future of street lighting is control through sensors. TE has been active in driving the market for street lighting and we believe the future of this market is lighting controls. Up to 30% of a municipality's energy budget is spent on powering streetlights and we have seen more technology go into street lights in the last ten years than in the past six decades. However, achieving energy savings in street lighting is not as simple as just changing out the incandescent light sources. There are 300 million installed luminaires globally, growing to 350 million by 2025. By 2025, there will still be 200 million luminaires left to update to LED. By adding in sensor controls to give part night or dimmable light, further energy savings can be made.

Effect of COVID-19 on the outdoor lighting market

In the outdoor space, COVID-19 hasn't had much of an effect. It's been regional so in poorer countries, where they had to spend a large part of their budget on COVID-19 activities, spending on public lighting was stopped. This came back online fairly quickly and we started to see enquiries again from countries such as those in Central and South America.

A regional approach to street lighting infrastructure

It's necessary to take a regional approach to street lighting due to the different infrastructures in place. In the UK and USA, street lights are permanently powered, with unswitched energy supplied to streetlights, so a control device of some description needs to be installed on every single street light to turn them on. The UK has unmetered and tariff-based billing while the USA has metered some tariff-based billing. In mainland Europe we typically see group switching; this is where you have a control cabinet with a single photosensor on it which triggers to turn on a group of street lights at the same time instead of individually. European energy supplies are unmetered but group switching means that street lights are difficult to dim. Turning on and keeping on a group of lights is very wasteful and doesn't speak to sustainability at all.

Let there be light

Different technologies have been used over the years to automatically switch street lights on and keep them on until they are switched off for the daytime period. Photodiodes are now typically used to measure ambient light and then switch the lights on or off when the sun is setting or rising. There is also a trend towards connected photocells with a large number of manufacturers providing these. This means you can monitor street lights remotely,

reprogram them remotely as well as performing diagnostics remotely. As mentioned, in the UK we have unmetered supplies but, in the USA, where metering is done, you can take meter readings remotely as well.

> *"Motion sensing for streetlights will revolutionise the street lighting market and is something that TE and their competitors are looking at keenly. A system with motion sensors allows consumption levels to be optimised to keep people safe while not expending energy unnecessarily."*

Motion sensing for street lights

Motion sensing for streetlights will revolutionise the street lighting market and is something we and our competitors are looking at keenly. Motion sensing means that rather than have a street light on all the time, you can dim it down to a low level. It stays at this level until there is motion detected, at which point, the light will come back up to full brightness.

How motion sensing contributes towards a safer, more secure society

Traditionally, street lights turn on at dusk and then stay the same brightness throughout the dark period. Many local governments were making the decision to go for part night which is where the street light would turn off completely between certain times – typically between midnight and 4:00 am. There's a litigious issue around enabling this due to safety and security if an incident occurred which could have been avoided due to better light. Fewer crimes are committed in well-lit areas than areas with poor or no lighting, supported by studies such as Reducing Crime Through Environmental Design: Evidence from a Randomized Experiment of Street Lighting in New York City. This report details a randomised controlled trial involving nearly 40 public housing developments, all of which had elevated levels of crime, and half of which received new lights and half did not. It was shown that developments that received new lights experienced crime rates that were significantly lower than would have been the case without them.

Adding motion sensors enables the best of both worlds. When councils take the decision to turn off streetlights completely for a period, people will not feel safe walking down streets in the dark. A system with motion sensors allows consumption levels to be optimised to keep people safe while not expending energy unnecessarily. The path ahead can be illuminated to a low brightness level at night, keeping consumption down but allowing the pathway to be seen; then as a person walks down it, the lights will come up to full brightness for as long as they remain walking down the path.

PIR and radar sensors – a comparison

There are two technologies being used for motion sensing - passive infrared (PIR) and radar. Designers should consider range, object sensitivity and environmental factors when thinking about sensor performance.

PIR sensor monitors change in the infrared radiation, or heat, of an object. This means that if the object is stationary, PIR sensors cannot detect the motionless object. There could also be issues with detection in wintertime when people are

> *"Designers should consider range, object sensitivity and environmental factors when thinking about sensor performance."*

wearing a lot of clothing. As normal body temperature is 37 degrees Celsius, if the ambient temperature was the same, there could be issues with detection. This is not normally a problem at night-time in the UK, however.

PIR sensors can measure a larger range/detection zone than radar is capable of, and TE has achieved what we consider to be a market-leading detection zone of 30m x 6m. Typically you have 30 meters between streetlight poles and you want to still be in the light of one street light as you're triggering the next light to come on.

Radar sensors are also affected by environmental conditions, and water droplets may prevent them from working properly. They cannot detect a stationary object but, as radar detects any motion, designers will be relying on sophisticated software algorithms to filter out false movements such as a tree moving in the wind. Radar also has a limited range, to keep it as a low power device.

Zhaga Book 18: simplifying the addition of sensor nodes to LED luminaires

The Zhaga consortium is a global lighting industry organisation that aims to standardise interface specifications of components of LED luminaires, including connectors and sensing/communication modules. Zhaga aims to enable multivendor ecosystems of interoperable products, making sure products from different vendors work well together.

> *"By reducing the complexity around outdoor luminaires and sensors, and assuring plug-and-play interoperability, Zhaga adds value for the luminaire maker, the installer and the specifier."*

Where Zhaga has been successful and made quite an impact is street lighting. TE has made many contributions towards Book 18, a standard which addresses the smart interface between outdoor luminaires and sensing/communication nodes. Book 18 specifies power and communication aspects in addition to the mechanical fit and electrical pins. Crucially, this standard allows any certified node to operate with any certified luminaire. Book 18 simplifies the addition of nodes such as sensors and communication nodes to LED luminaires. By reducing the complexity around outdoor luminaires and sensors, and assuring plug-and-play interoperability, Zhaga adds value for the luminaire maker, the installer and the specifier. Book 18 was first released in 2017 with the latest update in April 2021.

Disadvantages of group switching

We are now starting to see motion sensors come to the market and several of them are designed to plug into the bottom of a street light. Traditionally, street lights in the UK and USA would have a single socket facing upwards. Mainland Europe had group switching, involving a control cabinet with a single photosensor which turns a group of street lights on at the same time. As mentioned earlier, dimming light sources using group switching is very difficult to do so signs of individual controls have begun to appear in mainland Europe.

Transforming cities to Smart Cities with sensor technology

With the first edition of Zhaga Book 18, we addressed the mechanical fit system of the interconnect. As we developed this, we created a communication platform to allow two nodes (sensor devices, communication nodes or control devices) to be connected to a single street light. This platform has the potential to be the backbone of Smart Cities.

We're trying to drive that market space with our sensor technology and Zhaga's platform so that different manufacturers have a standard interface, a standard wiring structure and a standard software protocol to communicate through the luminaire to the other node and, in turn, to the driver. This means that different manufacturers can create different devices that can plug into these street lights.

Extracting, analysing, and understanding data

It's early days but data analytics and big data is a very exciting area of engineering. Companies like Facebook, Google and Amazon use big data very innovatively to improve their customer experience and also target advertising. There is scope to do that in the street lighting space too. Big data, machine learning and data analytics will become more prevalent in Smart Cities and then the street lighting space.

> *"Big data, machine learning and data analytics will become more prevalent in Smart Cities and then the street lighting space."*

Sensor trends in the next five years

COVID-19 has put a strain on supply chains and logistics and highlighted that feeding a growing population can be challenging. We saw panic buying when COVID-19 first hit, and governments started talking about the need to grow more produce locally and be more self-sufficient. This speaks to sustainability too. Horticultural lighting helps optimise growth cycles and increase the speed at which plants can be grown. Countries like The Netherlands and Belgium are big producers of vegetables and flowers grown in greenhouses. By adding supplementary sensor-controlled lighting, they can grow more for more months of the year. Automating the growing process is a huge investment but as inflation rates rise and the cost of living increases, we'll see more automation in this area with robots picking and bringing plants to a station for an operator to process in a verified farm.

There are changes in the medical space particularly in North America due to legalisation of cannabis growth which will be a big market driver. Presently, demand is outstripping capacity here. There's not a lot of technology currently used to grow these plants but as capacity starts to meet demand, there will be greater investment into growth efficiencies.

Looking to the future

In the last six months we've started to see motion sensors come to market which speak directly to sustainability. Zhaga's two node architecture isn't just about these motion sensors. Street lighting is talked about often in regard to smart cities because it effectively offers a regularly-spaced power supply. We are working on other sensor devices that can be powered by street light supplies. There are exciting things to come in the sensor space now we have the Zhaga platform we can plug into and communicate through.

Jonathan Catchpole, *System Architect and Principal Engineer, TE*

Conclusion

Looking Into the Future

IR sensing will connect our world

With technology becoming heavily dominant in our homes and our workspaces, IR sensing offers the ability to monitor people, spaces, movement and temperature, in devices which can talk to the connected world. IR sensors will be present in our homes, workplaces, transport systems, hospitals and throughout our environment, performing remote sensing to keep us safe and healthy and ensure we are living in the most sustainable way possible.

Supporting sustainable living

At Solid State Supplies, we are seeing the drive for growth in sensors very much in the smart home, smart buildings and smart cities arena with a nod to living more sustainably and controlling our energy usage. This includes the street lighting market, outlined in chapter three by TE's Jonathan Catchpole, where a presence detection sensor is required as well as heating/ventilation applications in buildings where there is a desire to save energy, traffic monitoring and many other applications.

Healthcare monitoring and enabling independent living

There are certainly excellent opportunities in the healthcare market for IR sensor applications. IR sensors offer an enormous opportunity for monitoring people's health or movements remotely. The ability to track elderly people's movements will allow them to live independently and safely in their own homes for longer, instead of being removed to a care home or hospital. Of course, these devices can also be used in those settings to monitor the health and safety of patients or residents. Despite creating opportunities for medical applications such as healthcare monitoring, we saw that COVID-19 also slowed down the research and development of such products as NHS R&D facilities were closed due to the lockdown. We hope that developments in this market will not be held up in the future.

> *"Solid State Supplies looks to drive the IR sensor market forward and support our customers to help them overcome any challenges. When one customer was struggling with how to lens IR sensors and achieve the correct field of view, we partnered with an IR lens manufacturer to help address this challenge and achieve the best performance from their sensors."*

Partnering to overcome IR sensor design challenges

We are looking to drive the IR sensor market forward and support our customers to help them overcome any challenges. As an example of this, when one customer was struggling with how to lens IR sensors and achieve the correct field of view, we partnered with an IR lens manufacturer to help them address this challenge and achieve the best performance from their sensors, which is key when you're driving a market.

The future for the IR market

The UK and Ireland sensor markets are buoyant, and with the UK having a strong software offering and a reputation for excellence in electronics design, we see a great opportunity for the adoption of IR sensors into future connected devices. We are focused on helping our customers in their drive to develop new applications using IR sensors, maximise sensor performance, overcome any issues and succeed in their chosen sectors.

John Macmichael,
Divisional Managing Director,
Solid State Supplies