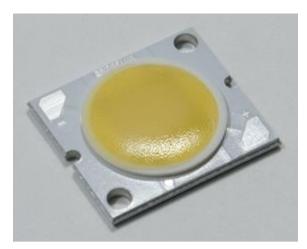# TECH NOTE: *Strobe; a new era for LED's and Machine Vision Lighting*

Multi-die LED arrays push to new era of Strobe Lights.

Multi-Die LED array courtesy of Bridgelux.

Multi-die LED arrays are changing LED strobe lights. A multi-die array LED product can contain 50 up to 100 LED's on a single housing. Using hundreds of small high power LED's or multi-die LED arrays in a strobe light output it can outperform existing high output lights including halogen, metal halide and even xenon flash lamp.

Xenon flash lamps have a short duration of active light strobe time. Common flash lamp strobe lamps have duration times of 6 to 30 microseconds. A LED can be strobed for any duration that is within the safe limit of current as long as heat is managed. The shorter the strobe time the more power the LED can be over driven producing more light intensity. If a LED light is strobed for a hundred or even hundreds of microseconds a LED light can produce more intensity than a xenon flash lamp. Even more light intensity is available when the LED is strobed for milliseconds. Since flash lamp bulbs have a very short maximum strobe time a high power LED lights can match and outperform flash lamps using a longer strobe duration than the flash lamp. LED's can generate light for entire time an imager acquires the image.

Another setback of the flash lamp is the maximum strobe rate. Common strobe rate is less than 100 Hz or 100 Strobes Per Second (SPS). An advantage of the LED is the extremely fast strobe rate. LED's can be strobed at high frequencies – hundreds of Hz and even thousands of Hz or SPS. Machine vision LED lights can strobe at rates up to and beyond 5000 SPS. There is no limit to the maximum strobe frequency of a LED although rates higher than 5000 SPS begin diminish the advantage of over driving. LED's are a solid state device and have a turn on time in hundreds of nanoseconds. LED's can be at full power in hundreds of nanoseconds making them a fast light source. LED's are perfect for strobing.

LED's can be strobed for any duration that is within the safe limit of current as long as heat is managed. LED's can be overdriven or pulsed at high currents for longer durations than flash lamps. LED's can be overdriven producing up to 10x the normal output vs. running at constant operation.   Over driving a LED involves pulsing at very high currents for a short time then allowing a rest time. Low duty cycles allow the LED to produce extreme intensities by pulsing at high currents with low heat. LED's offer the advantage of controlled light. The strobe time and the intensity can be controlled in a LED light. The strobe time and current to the LED's can be set allowing an exact amount of light output. A xenon flash lamp output is set by the size of the bulb and flash time is a constant. Flash lamps are not programmable in the amount of light or duration where an LED light allows the user full control.

Flash lamps use high voltage and discharge energy into the lamp. Because of the high voltage discharge flash lamps are known to misfire and not produce a flash. LED's are a semiconductor and driven by low voltage making them extremely reliable. LED's run consistently for millions of flashes.

Machine vision cameras have been making steady gains in speed with new cameras reaching a 1000 Frames Per Second (FPS). Faster machine vision cameras are allowing new inspections in applications that were not doable until now. High speed inspections are finding their way into all types of industrial applications. High speed cameras are making the transition from the scientific world to the machine vision industry.

The next generation LED lights will require the lights to strobe faster with even higher output. Smaller High power LED's are offering more light in even smaller physical areas. Technology will continue to reduce the size while increasing the power of lights filling the need for high speed machine vision. Strobed over driven LED lighting is the future for the high speed machine vision industry.

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