Exposure and Strobe Delay vs. Shutter Type Timing App Note
The exposure times and strobe delays will vary from camera to camera depending on the type of shutter used. This application note explains the differences between these shutters and provides an understanding on how to set the exposure and strobe delay appropriately.

Rolling Shutter Timing
With a rolling shutter, the top row of the sensor starts exposing before the bottom row starts. When the exposure time is reached, the top row is read out while the other rows are still being exposed. All rows are exposed for the same period of time but the time in which they start and stop exposing are different.

To properly synchronize a flash or strobe with this type of shutter you need to delay the firing of the strobe to the point where every row is completely exposed. Typically, this timing is the shutter roll on time. This time is usually the same time as the readout time of the sensor.
The exposure value also needs to be long enough so as to ensure that all rows are exposed at the same time but also provide enough time to capture the flash/strobe light that is reflected back from the target object.

The issue with this type of sensor is that, while the sensor is waiting for the shutter to open and close, each exposed line is still accumulating light. For larger sensors this could cause over exposure of the images if the ambient light is too strong. To minimize this effect, smaller aperture lenses are required to minimize the amount of ambient light that seen by the sensor.

**Half-Global Shutter Timing**

With the half-global shutter, the entire sensor is exposed at the same time. When the exposure time is reached, the first row is read out while the other rows continue to gather light. The effect of this type of shutter is that the bottom rows are more exposed than the top rows.
These types of cameras make it easier to synchronize a flash. Since each row of the sensor starts exposing at the same time, the strobe delay can be minimized. This shutter type allows for shorter exposures when using a flash.

The drawback to this type of shutter is that it still accumulates light while the rows of the sensor are being read out. If there is a lot of ambient light, the lower rows of the sensor will seem brighter in the acquired images. This is more noticeable with short exposures.

**Global Shutter Timing**

With a global shutter, the entire sensor is exposed at the same time and stops accumulating light at the same time. The top row of the sensor starts and stops its exposure at the exact same time.

These types of cameras are the easiest to use with a flash. There are no issues with accumulating unnecessary light in the images and are great at stopping motion.
Exposure and Strobe Delay vs. Shutter Type Timing

Disclaimer
Lumenera Corporation reserves the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to Lumenera Corporation’s terms and conditions of sale supplied at the time of order acknowledgment.

Lumenera Corporation warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with Lumenera Corporation’s standard warranty. Testing and other quality control techniques are used to the extent Lumenera Corporation deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

Lumenera Corporation assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using Lumenera Corporation components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

Lumenera Corporation does not warrant or represent that any license, either express or implied, is granted under any Lumenera Corporation patent right, copyright, mask work right, or other Lumenera Corporation intellectual property right relating to any combination, machine, or process in which Lumenera Corporation products or services are used. Information published by Lumenera Corporation regarding third-party products or services does not constitute a license from Lumenera Corporation to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from Lumenera Corporation under the patents or other intellectual property of Lumenera Corporation.

Reproduction of information in Lumenera Corporation data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. Lumenera Corporation is not responsible or liable for such altered documentation.

Resale of Lumenera Corporation products or services with statements different from or beyond the parameters stated by Lumenera Corporation for that product or service voids all express and any implied warranties for the associated Lumenera Corporation product or service and is an unfair and deceptive business practice. Lumenera Corporation is not responsible or liable for any such statements.