Preliminary

GEViCAM

GigE Vision Camera GF-Series

GF-4000 / GF4000C
(4 Mega CMOS GigE camera)

also available

Features

- 1Gigabit/s high speed point-to-point transmission
- No frame grabber required for image capture
- 100m with Gigabit Ethernet cable CAT5e or CAT6
- GigE Vision standard compliance
- Field upgradeable firmware via Ethernet
- Excellent Dynamic Range for 10-bit or 8-bit output
- No-delay asynchronous reset with time stamp and async shutter
- GPIO for local I/O, RS-485 communication for auxiliary devices
- Color (RGB Bayer) versions
- F-mount, robust package (60 x 60x 100 mm)
- Industrial Ethernet and GPIO connectors
- Various drivers available for existing machine vision software
- Extensive software developer's kit (SDK)

General Description

The GEViCAM GF-4000/C is a Gigabit Ethernet camera for industrial applications. It is designed on a common platform and complies with the GigE Vision standard for plug-and-play, or with a proprietary high performance SDK. The GF-4000/C features a 4MP CMOS sensor running at 15 fps.

For multiple camera applications, it accepts external trigger via a GPIO (general purpose I/O), resets the internal timing with no-delay and provides a time stamp for exact image location. This eliminates a need for external sync (HD/VD), which tends to generate some PLL jitters.

The streamlined design of the camera and GigE section reduces the component count and results in a high performance camera at low cost. This is an ideal opportunity to upgrade machine vision applications from conventional analog cameras (plus frame grabber) to a frame grabberless systems for improved cost-performance.

GigE Vision itself has additional advantages over conventional systems: It allows multiple camera operations on the network, multicasting (multiple computers per camera), long cable distances (100m without repeaters) and auxiliary device control via GPIO, plug-and-play compatibility with commonly available software and camera systems and common camera control protocol or GUI. The firmware or software is field upgradeable via Ethernet even if the camera is installed in a remote location.

The GPIO uses a 20-pin MDR connector and interfaces with TTL (trigger and strobe), RS-485 or CAN, opto-isolated I/Os and digital audio. A user can download its control protocol for the local auxiliary devices such as a PLC or surveillance controls, where the GigE camera operates as a local server. Auto-iris or DC-iris lens control is available as an option. Audio CODEC is standard for remote audio input and output via Ethernet.

The platform provides full progressive scan, partial scan, various exposure controls, and other special functions. GigE buffer also allows various sizes of images (Region of Interest) to be captured and transmitted.

*Product specifications and features are subject to change without notice.

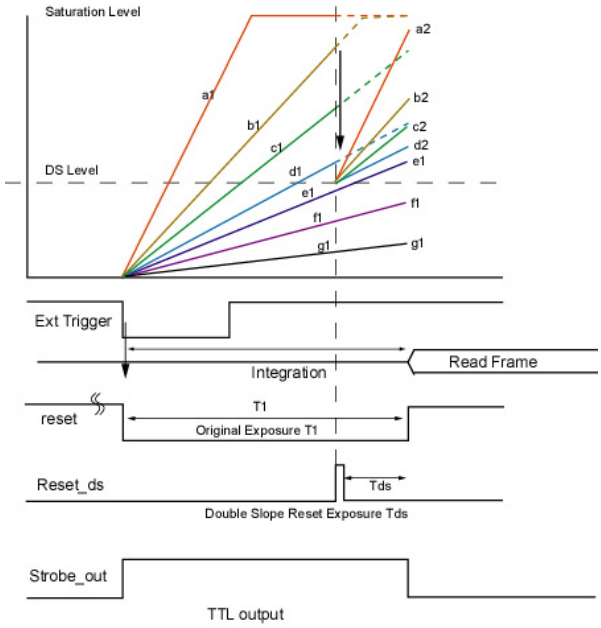
Double Slope Pulse Control

There are two phases of charge integration (exposure) mechanisms in the CMOS sensor. The first slope is based on total exposure time, where total charges are proportional to exposure time (ExposureTimeAbs). The second slope is created by the double slope voltage and double slope reset timing.

The following diagram is the mechanism of DS reset. "T1" is total accumulation (exposure) time set by Snap-shot shutter timing. Line "***a"*** is the brightest object and "***g*** " is the darkest object. Without DS reset, the dotted lines represent the output level of accumulation.

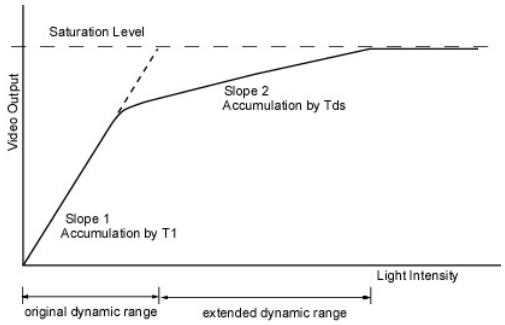
When DS level and DS reset are applied, any charges accumulated over DS level are dumped out at the DS reset time and restart at the same rate of the original accumulation speed for rest of total exposure time (Tds). Any light levels below DS level at DS reset continue the same accumulation. This operation is similar to having a second shutter within the main shutter condition. A typical example of the application is T1 = 1ms and Tds = 100µs.

As you can see, "a1" is easily saturated at normal shutter condition but with DS reset the level is dropped to "a2" where dark images of "e1", "f1" and "g1" increase until end of T1. This creates two slopes to increase the total dynamic range significantly (66 dB to >90 dB = 32000:1).



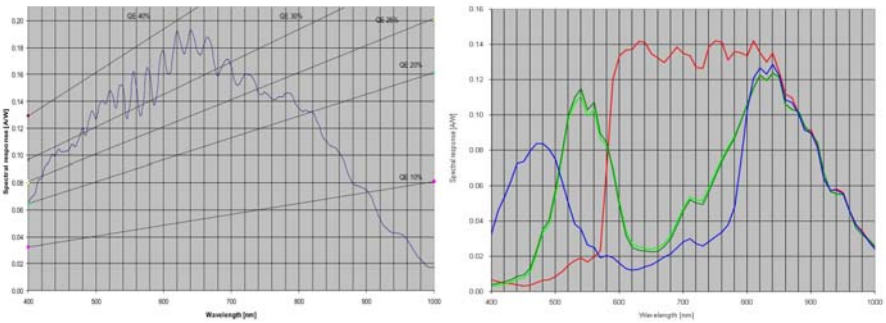
Difference from typical Gamma, knee control, or LUT method.

Knee control or Gamma control is a common method for many cameras to increase the dynamic range. However, most are secondary processes by the analog amplifier or by digital data conversion from fixed photodiode charges into video output, which enhances dark areas' and reduces the brighter areas' gain. Once the photodiode saturates, there is no usable signal. Therefore, total dynamic range is limited with photodiode charge capacity. The GF-4000 uses large photodiodes (12µ x 12µ vs. 7.4µ x 7.4µ of a CCD) to begin with, and then the charge accumulation is controlled by the unique double slope pulse control so that charge accumulation has a much larger dynamic range than common photodiode.



Specifications (C: Color version)	GF-4000/4000C
CCD Imager	1-3/8" 4MP
Active Pixels (data out)	2048 x 2048
Pixel Size (µm)	12 x 12
Active Area (mm)	24.6 (H) x 24.6 (V)
Scanning Mode	Progressive scan full
Frame Rate	15 fps
Data Clock	66.6 MHz
Data Output	Gigabit Ethernet
Resolution	2048 x 2048
S/N Ratio	>50 dB
Minimum Illumination	1.0 lux at 15 fps
Gamma	1.0 / 0.45 LUT
Power Requirement	12 V DC ±10%, 4W
Lens Mount	F-mount
Operating Temperature	-10°C to +50°C
Vibration	7Grms
Shock	70G
Size (mm)	60 x 60 x 100 mm
Weight	410 g (14 oz)

<GF-4000 Spectral Response>



GPIO Pin Assignment

1	12V RTN (GND)	11	Power in 12V
2	GND	12	Trigger in (TTL)
3	Strobe out	13	RS-485-
4	RS-485 +	14	Opto D1 in-
5	Opto D1 in +	15	Opto D2 out-
6	Opto D2 out +	16	Spare1 Out
7	GND	17	LRC Out
8	Light Status	18	Flash Status
9	Spare1 In	19	Spare2 Out

GEViCAM Inc.
673 S. Milpitas Blvd., Milpitas, CA, U.S.A. 95035 Phone: 408-945-9900, Fax: 408-262-0962 E-mail: info@gevicam.com
1698 Yosemite Drive, Milpitas, CA, U.S.A. 95035 Phone: 408-262-5772, Fax: 408-262-0962 Website: www.gevicam.com