

GigE Vision Camera GP-Series

GP-3360 (VGA), GP-3780 (XGA), GP-21400 (SXGA)



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 S/N (>58dB) for 12-bit, 10-bit or 8-bit output, 12 to 8-bit Gamma conversion and custom LUT
- No-delay asynchronous reset with time stamp and async shutter
- GPIO for local I/O, RS-485 communication for auxiliary devices, Audio I/O, Auto-iris lens drive
- Color (RGB Bayer) versions
- Miniature, robust package (34 x 34 x 68 mm)
- Industrial Ethernet and GPIO connectors
- Various drivers available for existing machine vision software
- Extensive software developer's kit (SDK)
- Best of all, Low-cost High-performance GigE camera

General Description

GEViCAM GP-Series are Gigabit Ethernet cameras for industrial applications. They are designed on a common platform and comply with the GigE Vision standard for plug-and-play performance as well as proprietary high performance SDK. GP-3360 uses 1/3" VGA (659 x 494) CCD, GP-3780 uses 1/3" XGA (1024 x 768) CCD and GP-21400 uses 1/2" SXGA (1392 x 1040) CCD with a 12-bit A/D converter. The normal data output is selectable for 12-bit, 10-bit (MSB), or 8-bit (MSB) at 40 MHz to maintain excellent S/N ratio of >58 dB at factory default. The frame rate is 100 fps for VGA, 31 fps for XGA, and 23 fps for SXGA.

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

Streamlined design for the camera and GigE section reduces the component count and make these cameras very compact and low cost for the performance. This is ideal for machine vision applications to move up from conventional analog cameras (+frame grabber) to frame grabber-less

systems for improved cost-performance.

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

The GPIO uses a 14-pin MDR connector and interfaces with TTL (trigger and strobe), RS-485 or CAN, opto-isolated I/Os, and digital audio. A customer can download its control protocol for the local auxiliary devices such as PLC, 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 control, and other special functions. GigE buffer also allows various size of images (Region of Interest) to capture and transmit.

Camera Functions and Controls

Scan Mode (*AquisitionMode*):

Models	VGA	XGA	SXGA
Full Scan Mode:	656 x 494	1024 x 768	1392 x 1040
Partial Scan Mode:	656 x 240	1024 x 400	1392 x 720
	Variable (programmable) starting lines		

Exposure Control (*ExposureMode, Exposure-TimeRaw*): Variable from 1n to FFFF (65535)n
 VGA:1n = 20 μ s, XGA/SXGA:1n = 40 μ s
 (= 1/50,000sec) (= 1/25,000sec)

Trigger Functions (*TriggerMode*):

Async no-delay Trigger:

Resets internal H and V sync to pixel clock level.
 Exposure is programmable in each mode.

Pulse-width Control (*ExposureWidth*):

Resets at external pulse leading edge and trailing edge with no-delay reset. The exposure time is exactly the same as the pulse width.

Hardware or Software Trigger (*TriggerSelector*):

Trigger type is selectable as PLC (GPIO) function. Hardware is TTL external trigger. Software is initiated by PLC and remote controlled via Ethernet.

Trigger Polarity (*TriggerActivation*):

Leading edge of Falling edge (default) or Rising edge selectable.

Strobe Functions:

Strobe / Exposure Pulse Output:

With all async reset modes, the internal exposure pulse is output from GPIO pin. This can be used to trigger strobe or other control devices.

Back-to-back Strobe:

Two consecutive strobes per one trigger can be applied with programmable intervals before and after transfer gate. Thus two frame images at very short intervals can be captured. Good for high speed object motion analysis, dual lighting (i.e. front-lit and back-lit, two color LEDs) imaging, etc. This mode is only applied to Full Scan mode.

Multiple Frame Capturing with Bracketed Exposure:

This is similar to multiple-shot photography with different exposures to bracket the exposure condition. This is a great tool for ITS license plate reading, or high security identifications of critical object imaging. Number of frames to capture is programmable as well as each exposure time (example; three shots per trigger with 1/250, 1/500, 1/1000s and use the best image among three)

Data Output (*PixelDepth*):

Camera image data output is 8-bit as the default. 10-bit, 12-bit (raw data) or 16-bit is also selectable to meet the image processing requirement.

LUT (Look up table):

12-bit-to-8-bit optimized Gamma 0.45 table is built-in. The User can access to LUT registers to make own LUT.

Test Pattern:

To diagnose Ethernet communication, test pattern generator is built in. (8-bit output)

Gain Control (*GainRaw*):

Camera gain is controlled in 10-bit resolution from 6dB to 42 dB (0~3FF).

Black Level / Offset (*BlackLevelRaw*):

Video black level control is in 8-bit resolution from 0 to 16 digital value out of 255 (0~FF)

Register Based Control:

Gevicam platform is register base. The command control is done with 16-bit of address and 32-bit of data in hexadecimal. To send **Gain** command of 255 (15dB) as an example, start with **Write** command "57" followed by address 00 10 and data 00 00 00 FF. It receives acknowledge of 06 after completion of command. To **Read**, send 52 00 10.

GPIO: GigE camera is powerful and can serve as a local server in a network. Besides common I/Os such as external trigger input and strobe signal output, it provides additional port controls. Gevicam can handle RS-485 serial interface, CAN (optional), Opto-isolated I/Os, digital audio input and output.

External Trigger: Hardware trigger of TTL level such as Vinit or edge trigger. Gevicam has no-delay reset capabilities to reset both horizontal and vertical sync without delay.

Strobe Output: This is used to drive external strobe (TTL). The signal is the internal exposure control pulse so that it can be monitored as exposure timing, image grabbing, and internal frame rate in each mode.

RS-485: Customers can send own RS-485 serial control signal via Ethernet. Profi-bus, surveillance pan and tilt, zoom lens, and lane control signals are some of examples. CAN device is also used for industrial serial control.

Audio Input and Output: It has a built-in audio CODEC to handle digital audio via Ethernet. It uses high speed serial port to take audio stream. The input can be used for analog input monitoring (AC-coupled) in audio frequency range such as Doppler speed meter, chopped DC level, etc.

Opto-isolated IO: These IOs are designed for applications which need different voltage, high surge/noise environment, signal isolation from camera, etc. It consists of 2 sets of opto-isolators and the input or output can be programmable. Standard is one input (D1) and one output (D2).

Temperature Sensor: Temperature sensor is built-in to monitor the internal thermal condition.

Thermal Considerations:

Because of high speed transmission, GigE components generate more heat than ordinary cameras. Gevicam series are designed to minimize the power consumption. However, it gets warm during operation. A heat pipe structure is developed to transfer heat from specific components to the base plate with very small thermal resistance thus stress of components is kept minimum for high reliability. It is advisable to mount camera to a relatively large heat sink structure (mounting bracket) for demanding applications.

Gigabit Ethernet (GigE) Section

Ethernet is the most popular and widely used digital communication method today. The technology is proven and robust. Gigabit Ethernet is an extension of fast Ethernet but has 1 Gigabit bandwidth, which is the best advantage for image processing and sending high resolution, high speed digital video to a host. It eliminates need for a frame grabber in machine vision thus cost performance improves against conventional [analog camera + frame grabber] or [digital camera (Camera Link) + frame grabber].

There are numbers of benefit to go to GigE cameras in many applications.

- Pleora engine: Gevicam uses industry-leading Pleora Technologies' engine, core and SDK.
- High performance driver to off-load CPU task
- Deterministic continuous data transfer at 1Gb/s for 100m or more with switches.
- Versatile SDK to support wide range of applications.

Frame Grabber Functions:

GigE camera interface acts as a frame grabber function and the brief specification is as follows;

On board Memory: 16 MB

Programmable Logic Control:

4 Pulse generators and Timers, 1 Rescaler, 1 De-layer, 1 Counter, Input debouncing, Timestamp generator, Timestamp trigger, Software controlled I/O, GPIO FIFO and LUT.

Serial Ports:

Internal UART 3 ports (Normally used for Camera control, RS-485 and Audio I/O)

Ethernet Band-width: 1Gb/s

Unicast and Multicast: Yes

Static Configuration: Yes, 4.01

BOOTP: Yes

DHCP: Yes, 4.06

Data Format:

Gray scale (8, 10, 12, 14, 16, 24-bit) and Color RGB Bayer

Image Size (capability):

Up to 4K (H, multiple of 4) x 4K (V)

Other Functions:

Windowing, Decimation, Data port mapping, Pixel shifting, Pixel inversion

SDK (Software Development Kit):

Standard SDK is written in Visual C++ in a Visual Studio environment. Pleora offers various SDKs for its driver and engines which include Visual Basic, Linux, and third party drivers such as MIL, NI, Halcon, Image Pro. All Gevicam controls are done in register base control and just need serial communication port to work with (Similar to RS-232 control via GigE port).

GigE Vision standard requires general compatibility but does not cover various functions of Gevicam features. SDK covers GigE Vision standard compliant version for general purpose or proprietary high performance version for OEM applications.

Field Upgrade:

Gevicam is designed to download the firmware via Ethernet without removing the camera from the existing system. This allows easy future upgrades in the field.

GPIO Cable and Industrial GigE Cable

Gevicam understands demanding applications in the industrial field. Even ITS applications require robust structure (roadside installations face constant vibration and extreme temperature changes). Both cables are designed for high reliability and Gevicam cameras are designed with secure means despite the small body size.



Applications

GigE based cameras are versatile and will find many applications where they fit into. Not only limited to standard applications, but also expand the capabilities into new fields as solution providers instead of mere components.

Machine Vision;

Cost-performance upgrade from analog cameras, Cost reduction for digital cameras, Network base system, Remote / long distance control, Compact system, Local server operation.

Medical, Scientific, Microscopy;

High resolution, High speed imaging, Multicast, Motion analysis, Low noise applications.

High Security / Surveillance;

High quality surveillance imaging (high resolution), Remote surveillance with Pan and Tilt control, Video and Audio monitoring.

ITS and Transportation;

License plate reading, Violation enforcement, Road-side monitoring.

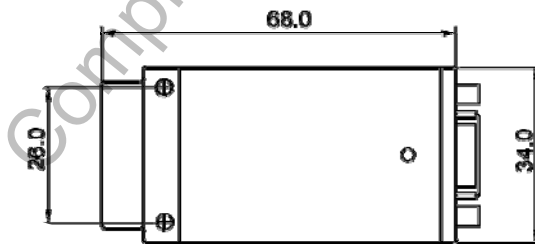
GigE Vision Camera GP-Series GP-3360, GP-21400

Specifications

(C: Color version)

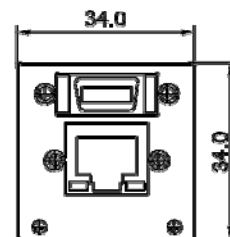
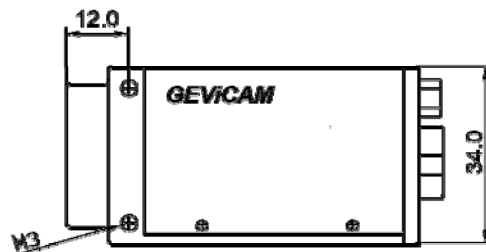
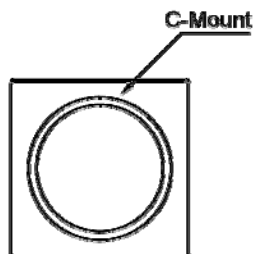
	GP-3360 / 3360C	GP-2360 / 2360C	GP-3780 / 3780C	GP-21400 / 21400C
CCD Imager	1/3" VGA	1/2" VGA	1/3" XGA	1/2" SXGA
Active Pixels (data out)	656 x 494	656 x 494	1032 x 779	1392 x 1040
Pixel Size (μm)	7.4 x 7.4	9.9 x 9.9	4.65 x 4.65	4.65 x 4.65
Active Area (mm)	5.79 (H) x 4.89 (V)	7.48 (H) x 6.15 (V)	5.80 (H) x 4.92 (V)	7.6 (H) x 6.2 (V)
Scanning Mode	Progressive scan full	Progressive scan full	Progressive scan full	Progressive scan full
Frame Rate	100 fps @40 MHz (60 fps optional)	100 fps @40 MHz	31 fps @31 MHz	23 fps @ 40 MHz (15 fps optional)
Data Clock	40 MHz	40 MHz	31 MHz	40 MHz
Data Output	Gigabit Ethernet	Gigabit Ethernet	Gigabit Ethernet	Gigabit Ethernet
Resolution	656 x 494	656 x 494	1032 x 779	1392 x 1040
S/N Ratio	>58 dB	>58 dB	>58 dB	>58 dB
Minimum Illumination	1.0 lux at 100 fps	1.0 lux at 100 fps	1.0 lux at 31 fps	1.0 lux at 23 fps
Gamma	1.0 / 0.45 LUT	1.0 / 0.45 LUT	1.0 / 0.45 LUT	1.0 / 0.45 LUT
Power Requirement	12 V DC ±10%, 4W	12 V DC ±10%, 4W	12 V DC ±10%, 4W	12 V DC ±10%, 4W
Lens Mount	C-mount or CS	C-mount or CS	C-mount or CS	C-mount or CS
Operating Temperature	-10°C to +50°C	-10°C to +50°C	-10°C to +50°C	-10°C to +50°C
Vibration	7G	7G	7G	7G
Shock	70G	70G	70G	70G
Size (mm)	34 x 34 x 68	34 x 34 x 68	34 x 34 x 68	34 x 34 x 68
Weight	115g (4oz)	115g (4oz)	115g (4oz)	115g (4oz)

Physical Dimensions



GPIO Pin Assignment

1	12V RTN (GND)	8	Power in 12V
2	GND	9	Trigger in (TTL)
3	Strobe out	10	RS-485 -
4	RS-485 +	11	Opto D1 in -
5	Opto D1 in +	12	Opto D2 out -
6	Opto D2 out +	13	Audio out
7	GND	14	Audio in



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