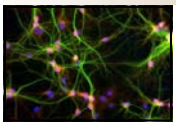
GEViCAM

Preliminary

GigE Vision Smart Camera GN-Series

GN-3000 / GN-3000C
(1/3” WVGA Neural Network GigE camera)



World’s Smallest Gigabit Ethernet Camera from GEViCAM

GiGE VISION also available

Features

- Hardware Neural network (CogniMem) built-in
- 1024 Neurons with 256 Byte per Neuron
- 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 compliant version also available
- Field upgradeable firmware via Ethernet
- High performance CMOS with global shutter and AEC and AGC functions
- 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 available
- Miniature, robust package (34 x 34 x 68 mm)
- Industrial Ethernet and GPIO connectors
- Various drivers and SDK available for existing machine vision software

General Description

The GEViCAM GN-Series is comprised of Gigabit Ethernet smart cameras with a built-in high performance hardware Neuron chip. They are designed on a common platform and comply with the GigE Vision standard for plug-and-play compatibility as well as a proprietary high performance SDK. GN-3000 uses a 1/3” WVGA (748 x 480) CMOS with global shutter. Even though the smart camera is a stand alone system, the real time data output is available in 10-bit, or 8-bit (MSB) at 27 MHz. The frame rate is 60 fps for full resolution and at faster rates in ROI scanning.

The neural network chip, CogniMem* is a radial based or KNN nonlinear recognition engine with 1024 neurons, all connected together for simultaneous parallel access. Each neuron is 256 in length by one byte deep, as if each neuron has 256 dendrites of 8-bit data and all connected to the common data source.

Imager output is directly connected to CogniMem and the hardware neural network performs the recognition tasks in 1.4 µs after reception of vector data. The vector data conversion is implemented from the direct video input during V blank (FVAL= low) in the each frame.

The neurons are trained on-line and off-line. The typical method is to set the camera to work and capture the images and save them. Using Image knowledge Builder (“IKB”), they can then be trained and classified in a short amount of time and then reloaded back into the camera.

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 original camera is installed in a remote location.

The GPIO uses a 14-pin MDR connector and interfaces with TTL (trigger and strobe), RS-485 or CAN, and opto-isolated I/Os. A user can download the control protocol for local auxiliary devices such as a PLC or surveillance controls, where the GigE camera then operates as a local server. GN-3000 has built-in AEC (auto-exposure control) and AGC (auto-gain control) capability.

GigE Vision Camera GN-3000 / GN-3000C

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

Specifications

(C:Bayer Color version)

	GN-3000 and GN-3000C
CMOS Imager	1/3" WVGA
Active Pixels (data out)	752 x 480
Pixel Size (μm)	6.0 x 6.0
Active Area (mm)	4.51 (H) x 2.88 (V)
Scanning Mode	Progressive scan full
Frame Rate	60 fps @ 26.7 MHz
Data Clock	26.7 MHz
Data Output	Gigabit Ethernet
Resolution	752 x 480
Dynamic Range	>55 dB linear, >100 dB knee
Number of Neuron	1024
Data length per Neuron	256 Byte
Power Requirement	12 V DC ±10%, 4W
Lens Mount	C-mount or CS
Operating Temperature	-10°C to +50°C
Vibration	7 Grms
Shock	70G
Size (mm)	34 x 34 x 68
Weight	115g (4oz)

CogniMem Neural Network Principle

Neurons can learn and recognize input vectors automatically. If several neurons recognize a pattern, the response of all can be retrieved in increasing order of distance (= decreasing order of confidence). The first response is the category of the first neuron with a distance register of the smallest distance, which is called "the best match" category. The more the learning, the more the distance reduces for better match.

CogniMem's recognition engine which provides the category of the neuron with the best match within next 36 clock cycles (1.4 μs) after receipt of digital data input.

The recognition engine extracts a signature from a region of interest (ROI) and generates the input vector internally. The ROI is defined with a set of 6 parameters:

Left and top coordinates
Size of ROI (width and height)
Size of primitive blocks (B-width and B-height)

Primitive block size must fit into ROI in less than or equal to 256.

Teaching is done in the ROI to categorize the space vector.

The category can range up to 16384 with 0 reserved for background data.

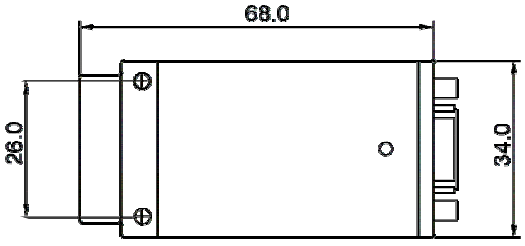
Recognition outputs are readable for Distance, Category and Status value.

The distance ranges between 0 and 32768 (15-bit) where 0 is exact match of stored pattern in one neuron and Distance 32768 means no-match found.

The Status can be one of three: 0 = Unknown, 1= Identified, 2 = Uncertain.

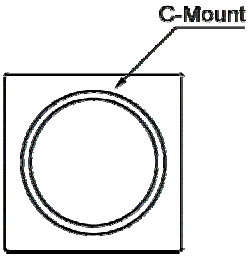
In real time recognition, it recognizes the category 14 μ s after each frame (during FVAL=low).

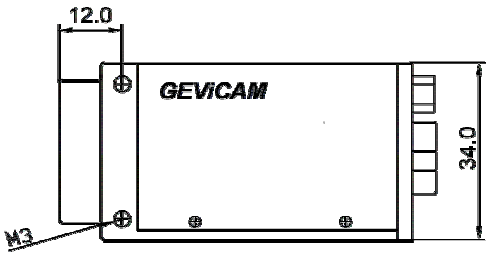
Physical Dimensions

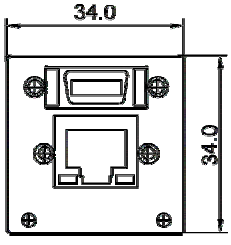


GPIO Pin Assignment

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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