## ◆ Application

The ITV-GECWV408M JPEG compression module performs as a video camera or a JPEG compressed still camera and can be attached to a wireless or PDA host. Users can send out a snapshot command from the host in order to capture a full resolution single-frame still picture. The picture is then compressed by the JPEG engine and transferred to the host.
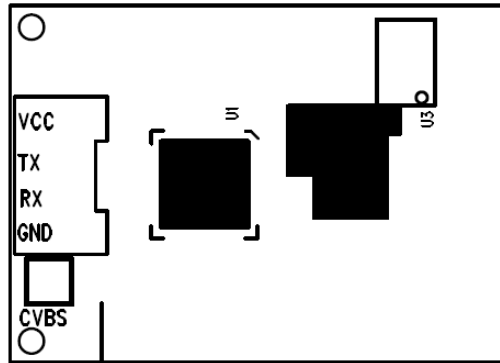
◆ Feature

1. Small size: 20mm x 28mm (L x W).
2. 0.3M CMOS sensor, VGA resolution, down sample to QVGA.
3. Video-out: VGA & 60fps, optional.
4. Low power consumption, 3.3V operation.
5. UART interface support up to 115.2Kbps.
6. Built-in JPEG CODE.
7. Built-in lens, optional.

◆ Outline
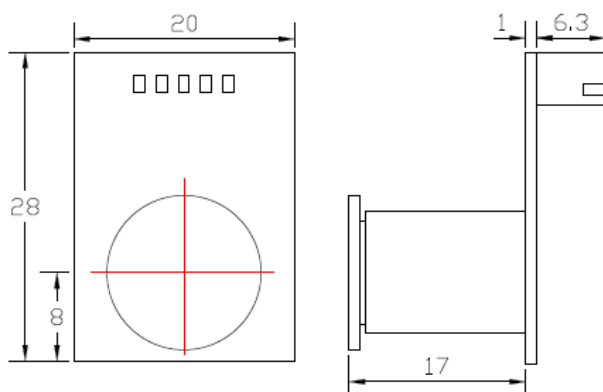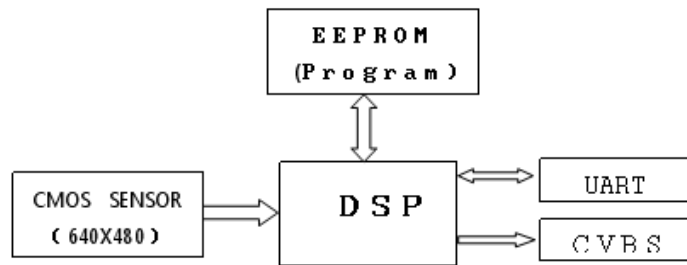
◆ Board Layout

◆ Block Diagram

◆ Pin Function
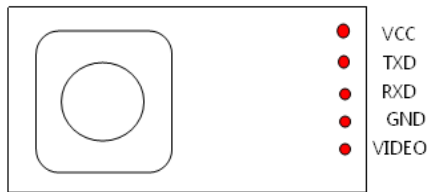
PIN	Description
VCC	Power 3.3VDC
TXD	Data Transmit(3.3V)
RXD	Data Receive (3.3V)
GND	Power Ground
VIDEO	1V p-p

◆ Lens Structure
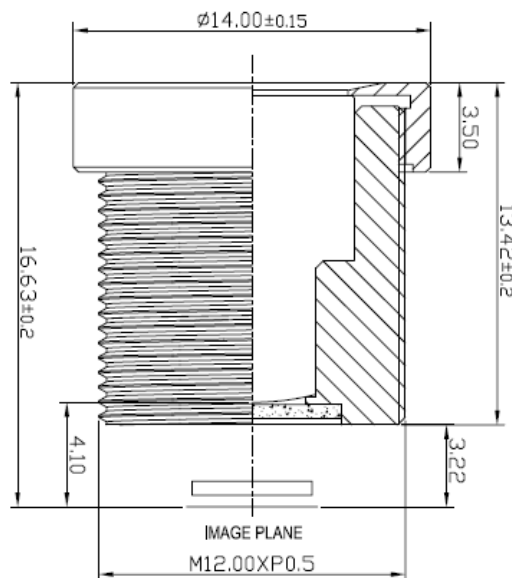
◆ Specification

Item	Specification	Remark
Pixel Size	PAL:628 x 582 / NTSC:510 x 492	
Image Sensor	1/5"	CMOS sensor OV7740
Baud Rate	9.6Kbps~115.2Kbps	
Output	TTL	
Operating Voltage	3.3V±10%	
Working Current	90 mA	
Lens	Construction: 2G2P+IR filter	
	Effective Focal Length:1.7mm	
	F#:2.0	
	FOV:125°	
	Distortion <-3.5%	
	Relative illumination: 60% Ø3.44	
Operating Temp.	-20°C ~ +60°C	

User Manual

1. Serial Interface

1.1 Baud Rate

ITV-GECWV408M supports total 5 types of baud rate: 9,600bps, 19,200bps, 38,400bps, 57,600bps and 115,200bps. **Default** baud rate is **115,200bps**. In other words, host needs to use 115200bps at the first connection with ITV-GECWV408M. After the first connection, host can change the baud rate to other supported values.

1.2 Single Byte Timing Diagram

A single byte RS-232 transmission consists of one start bit, 8-bit contents and one stop bit. A start bit is always 0, while a stop bit is always 1. LSB is sent out first and is right after the start bit.
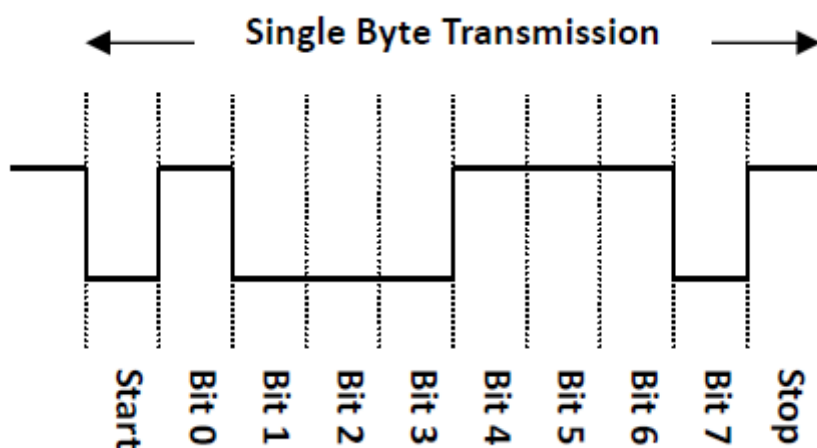
Figure 5 RS232 communications – single byte timing diagram

1.3 Command Timing Diagram

A single command consists of 4 or more (depends on **data length**'s value) continuous single byte RS-232 transmissions.   The following is an example of **GET VERSION** (56h, 00h, 11h, 00h) command.
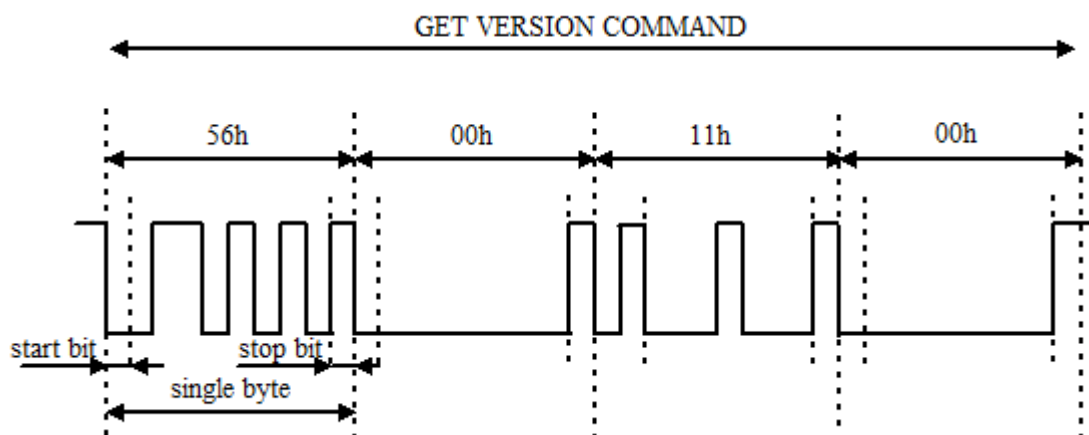
Figure 6 GET VERSION command timing diagram

1.4 Command summary

Command	Functions
GET VERSION	Get Firmware version information
SYSTEM RESET	System reset
FBUF CTRL	Control frame buffer
GET FBUF LEN	Get image lengths in frame buffer
READ FBUF	Read frame buffer
SET BAUDRATE	Set serial baud rate
SET SAMPLESIZE	Set image size(VGA/QVGA)
SET COMPRESSRATIO	Set image compressed rate
COM REPLY	Host will get reply command from ITV-GECWV408M

Table 1 command summary

1.5 Command format

Protocol sign(1byte) + Serial No.(1byte) + Command(1byte) + Data length(1byte) + Control data(nbytes)

Protocol sign: This one byte field indicates the transmitting mode of the command.

Protocol sign	value	definitions
Sending command	56h	The command is sent from the host to ITV-GECWV408M
Replying command	76h	Command is received from ITV-GECWV408M to the host

Table 2 protocol sign

Serial No.: Now this one byte field is invariably set to 0.

Command: This one byte filed indicates the command function. About the detail, please refer to Table 3 command set.

Data length: This one byte field specifies the total length in bytes of **control data** by which is followed.

Control data: The data of this field is only meaningful when **Data length** is not equal to 0. This data depends on the different commands. About the details, please refer to the

following sections**.**

1.6 Command protocol

Command name	Protocol sign	Serial No.	Command value	Data length	Control data
GET VERSION	56h	00h	11h	00h	Don't care
SYSTEM RESET	56h	00h	26h	00h	Don't care
FBUF CTRL	56h	00h	36h	01h	To know data vaule of this field, please refer to the following sections
GET FBUF LEN	56h	00h	34h	01h	
READ FBUF	56h	00h	32h	0Ch	
SET BAUDRATE	56h	00h	31h	06h	To know data vaule of this field, please refer to the following sections
SET SAMPLESIZE	56h	00h	31h	05h	
SET COMPRESSRATIO	56h	00h	31h	05h	
COM REPLY	76h	00h			Depends on the different sending commands. To know data value of this field, please refer to the following sections

Table 3 Command set

1.6.1 GET VERSION Command

The GET VERSION command is used to get version information of the firmware running in ITV-GECWV408M.

1.6.1.1 Command format: 56 00 11 00

1.6.1.2 COM REPLY: 76 00 11 00 0B 56 43 30 37 30 36 20 31 2E 30 30 ("VC0706 1.00")

6.6.1.3 Communication protocol:
To get the firmware version, please follow the below operations:

HOST

GET VERSION
56 00 11 00

MODULE

COM REPLY
76 00 11 00 0B 56 43 30
37 30 36 20 31 2E 30 30
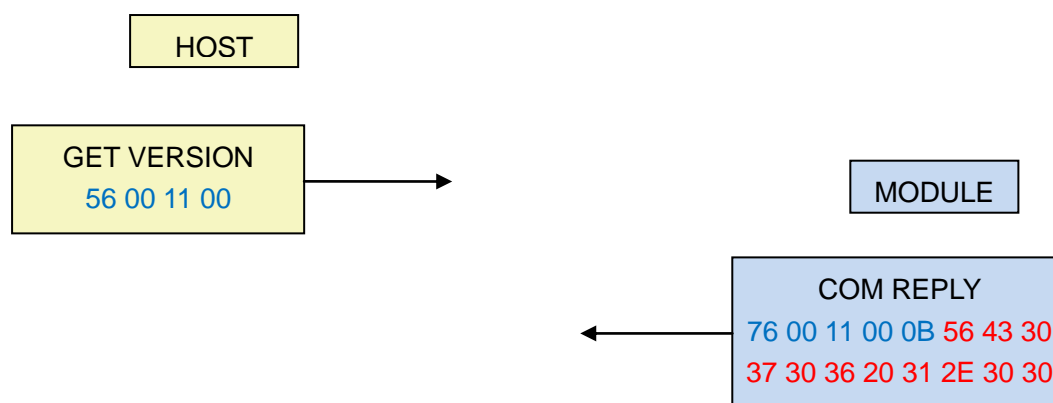
1.6.2 SYSTEM RESET Command

The SYSTEM RESET command is issued by the host in the following case:

✧ There is always no reply after several commands were sent by host.

1.6.2.1 Command format: 56 00 26 00

1.6.2.2 COM REPLY: 76 00 26 00 00

1.6.2.3 Communication protocol:

```
┌─────────────────────┐
│   SYSTEM RESET      │ ───────────────►
│   56 00 26 00       │
└─────────────────────┘
                                            ┌─────────────────────┐
                            ◄─────────────  │   COM REPLY         │
                                            │   76 00 26 00 00    │
                                            └─────────────────────┘
┌ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┐
    Delay 2000ms
└ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┘
```
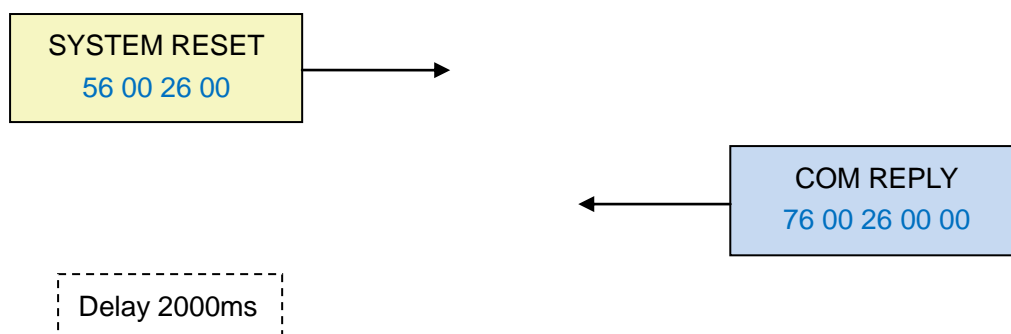
When the host has received the correct COM REPLY [76 00 26 00 00], after about ten milliseconds, ITV-GECWV408M is going to restart. About 2s later, ITV-GECWV408M works normally as usual.

1.6.3 FBUF CTRL command

The FBUF CTRL command is used to stop current frame image data update in frame buffer in order to get current frame still image.

1.6.3.1 Command format: 56 00 36 01 P1 where P1 (one byte) is the control parameter of video frame buffer. Table 4 lists out the definition of P1.

Frame control parameter (P1)	Definition
0	Stop frame buffer data update at current frame
3	Resume normal video state

Table 4 Frame control parameter

1.6.3.2 COM REPLY: 76 00 36 00 00

1.6.3.3 Communication protocol:

```
                              ╭─────────────────────╮
                              │ Stop    at   current │
                              │ frame                │
                              ╰──────────╮──────────╯
┌─────────────────────┐                 ╲
│   FBUF CTRL         │ ───────────────────►
│   56 00 36 01 00    │
└─────────────────────┘
                                            ┌─────────────────────┐
                            ◄─────────────  │   COM REPLY         │
                                            │   76 00 36 00 00    │
                                            └─────────────────────┘
```
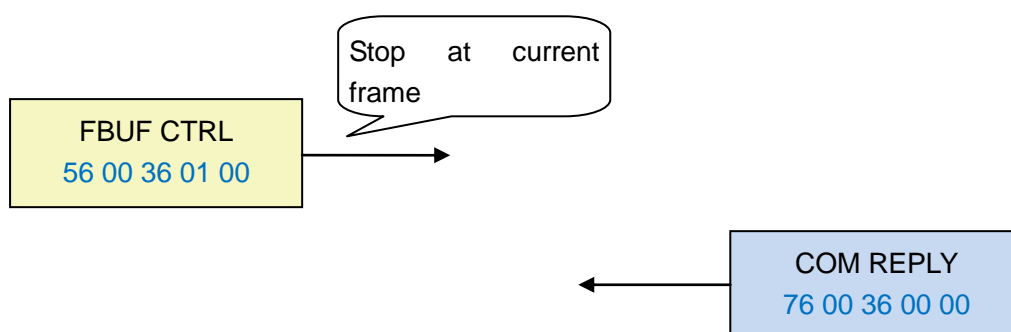
1.6.4 GET FBUF LEN command

The GET FBUF LEN command is used to get size of current frame still image in frame buffer.

1.6.4.1 Command format: 56 00 34 01 00

1.6.4.2 COM REPLY: 76 00 34 00 04 P2 where P2 (4 bytes) is the size of image data which host wants to get.

1.6.4.3 Communication protocol:

```
┌─────────────────────────┐
│  Get size of current    │
│  frame                  │
└─────────────────────────┘

┌─────────────────────────┐
│   GET FBUF LEN          │      ───────►
│   56 00 34 01 00        │
└─────────────────────────┘

                                  ◄───────   ┌─────────────────────────┐
                                             │      COM REPLY          │
                                             │  76 00 34 00 04 00 01   │
                                             │        2C 00            │
┌─────────────────────────┐                 └─────────────────────────┘
│ Current frame still     │
│ image data size is      │
│ 00012C00h               │
└─────────────────────────┘
```
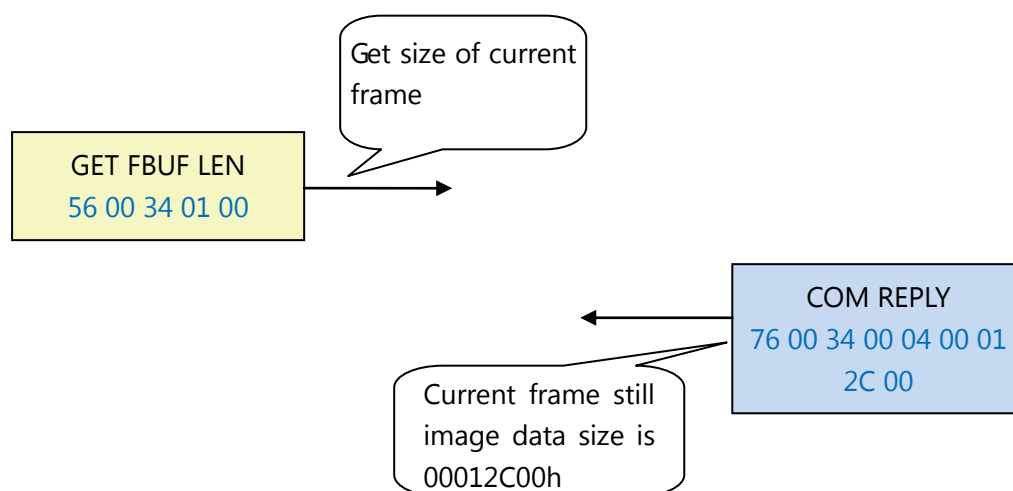
1.6.5 READ FBUF command

The host sends this command to get the image data from frame buffer.

1.6.5.1 Command format: 56 00 32 0C 00 0A 00 00 00 00 P3 P4 where P3 (4 bytes) informs ITV-GECWV408M that how many bytes of data the host is going to read. It must be multiple of 4. P4 (2 bytes) represents the delay time between the command and data received from COM REPLY (see 6.6.5.2). The time unit is 0.01 millisecond. For example: P4 = 10 00, delay time is 10 milliseconds.

1.6.5.2 COM REPLY: 76 00 32 00 00 P5 76 00 32 00 00 where P5 (n bytes) is the image data which host wants to get.   n is equal to P3 in this case.

1.6.5.3 Communication protocol:
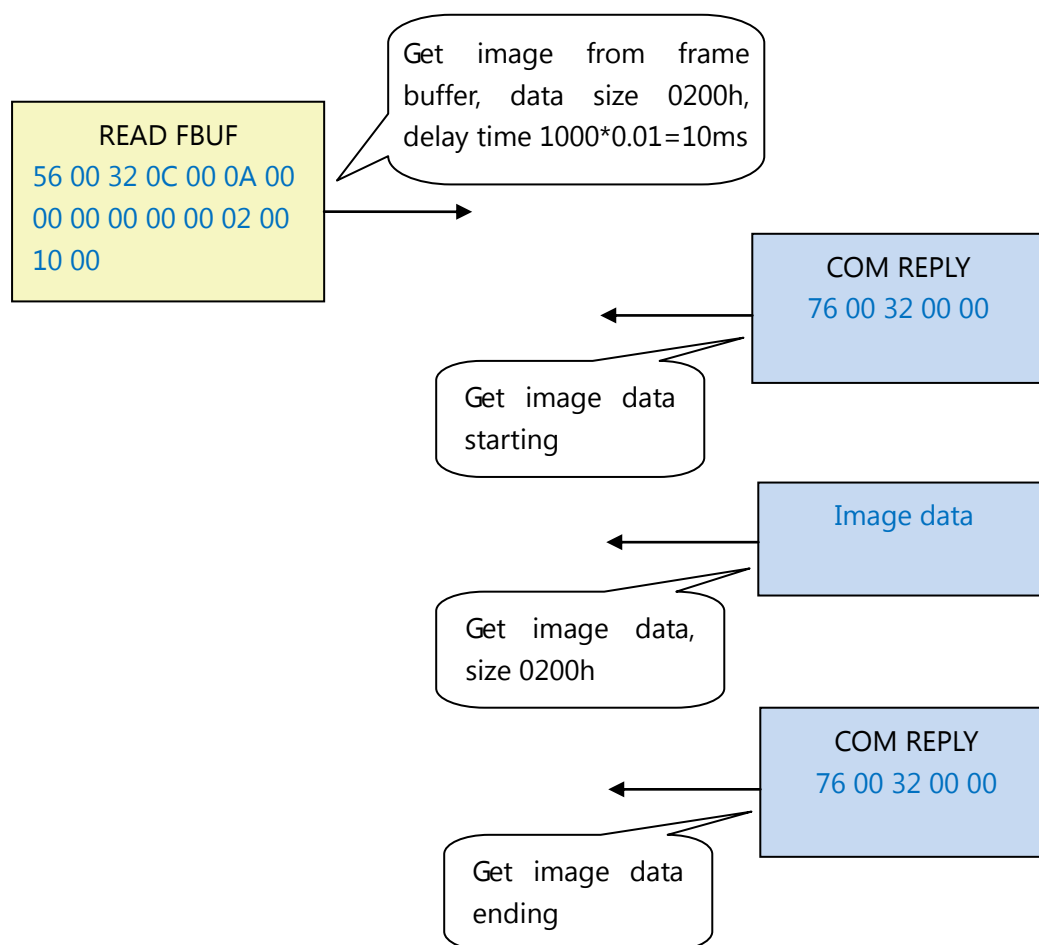
Note: Before sending this command, users should issue GET FBUF LEN command to get the image size first.

1.6.6 SET BAUDRATE command
The host issues this command to set the UART baud rate.

1.6.6.1 Command format: 56 00 31 06 04 02 00 08 P6 where P6 (2 bytes) is the configuration value of UART baud rate. The relationship between configuration value and baud rate is shown in Table 5.

Baud rate(bps)	Configuration value
9600	0xAEC8
19200	0x56E4
38400	0x2AF2
57600	0x1C4C
115200	0x0DA6 (default)

Table 5 Baud rate relationship

1.6.6.2 COM REPLY: 76 00 31 00 00

1.6.6.3 Communication protocol:

Set baud rate to 38400bps

SET BAUDRATE
56 00 31 06 04 02
00 08 2A F2

COM REPLY
76 00 31 00 00
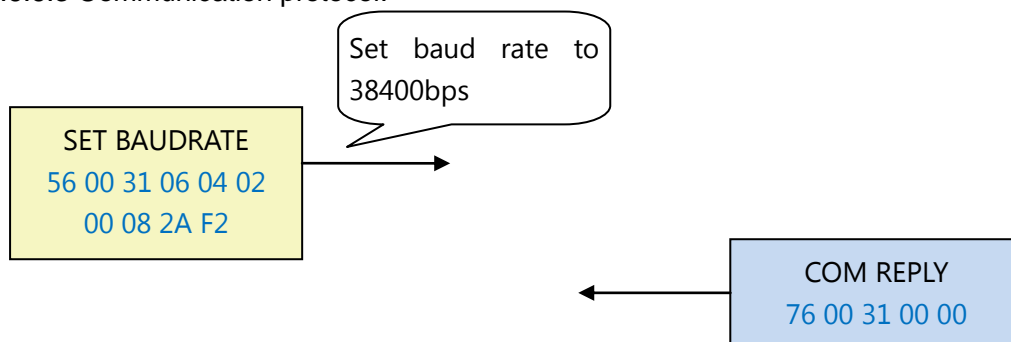
1.6.7 SET SAMPLESIZE command
The host issues this command to set the sample size of image (image resolution).

1.6.7.1 Command format: 56 00 31 05 04 01 00 19 P7 where P7 (1 byte) is the configuration value of image sample size. The relationship between configuration value and image resolution is shown in Table 6.

Image resolution	Configuration value
VGA	0x00 (default)
QVGA	0x11

Table 6 image resolution size relationship

1.6.7.2 COM REPLY: 76 00 31 00 00
1.6.7.3 Communication protocol:

Set image size to OVGA

SET SAMPLE SIZE
56 00 31 05 04 01
00 19 11

COM REPLY
76 00 31 00 00
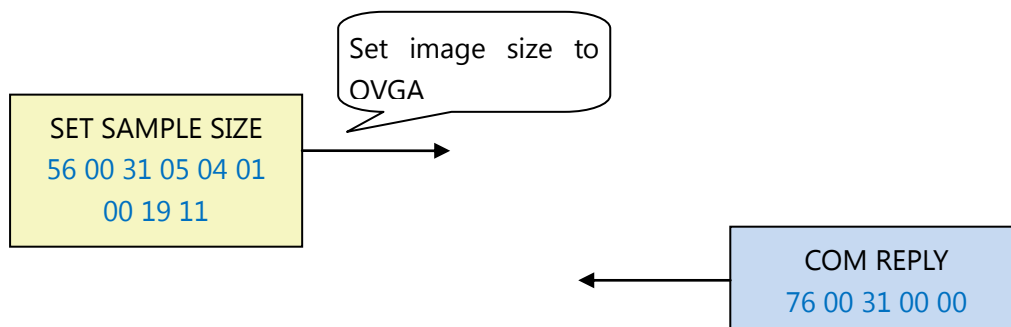
1.6.8 SET COMPRESSRATIO command
The host issues this command to set compressing rate of the image.

1.6.8.1 Command format: 56 00 31 05 04 01 00 1A P8 where P8 (1 byte) is the configuration value of image compression ratio. This compression ratio value is ranged from 0x00 to 0xFF. The bigger the value is, the higher the compression ratio. Default

compression ratio is **0x35**.

1.6.8.2 COM REPLY: 76 00 31 00 00

1.6.8.3 Communication protocol:
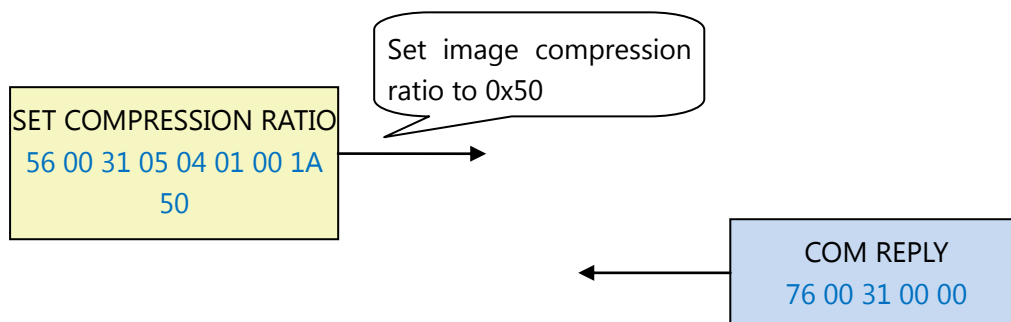
1.6.8 COM REPLY command

The COM REPLY is a UART command which is sent from ITV-GECWV408M in order to inform the host whether the command which was just sent is executed well or in order to transmit the data which the host wants to get. About all cases of COM REPLY command please refer to the above commands sections.

NOTE: When the host issues SET BAUDRATE command, SET SAMPLE SIZE command or SET COMPRESS RATIO command, the system needs to restart to take effect. These parameters are stored into camera module's built-in EEPROM. So next time module boots up, these parameters still work.

Appendix A – Flow diagram for getting an image

Below is the flow diagram for getting one or more images:

```
            ┌─────────────────────────┐
            │  Camera module power up │◄──────────────┐
            │     (ITV-GECWV408M)     │               │
            └────────────┬────────────┘               │
                         │ Wait for 2000ms            │
            ┌────────────▼────────────┐     N  ┌───────────────────────┐
            │ Connect with camera     ├───────►│ Camera module power   │
            │ module @ 115200bps      │        │ down (ITV-GECWV408M)  │
            └────────────┬────────────┘        └───────────────────────┘
                         │ Y
                ◄───────────────────►
               ╱ Needs to change EEPROM ╲       N
              ╱  parameters (baud rate,  ╲───────────────┐
              ╲  image resolution,       ╱                │
               ╲ compress ratio)?       ╱                 │
                ◄───────────────────►                     │
                         │ Y                              │
            ┌────────────▼────────────┐                   │
            │ Set BAUD RATE           │                   │
            │ Set SAMPLE SIZE         │                   │
            │ Set COMPRESS RATIO      │                   │
            └────────────┬────────────┘                   │
                         │ Y                              │
            ┌────────────▼────────────┐                   │
            │ SYSTEM RESET            │                   │
            │ (ITV-GECWV408M)         │                   │
            └────────────┬────────────┘                   │
                         │ Wait for 1000ms               │
            ┌────────────▼────────────┐    Y             │
            │ Connect camera module   ├──────────────────┤
            │ at new baud rate        │                  │
            └─────────────────────────┘                  ▼
```

Send FBUF CTRL command to stop frame buffer

Wait for 1000ms

SYSTEM RESET (ITV-GECWV408M)

Send GET PBUF command and be ready to get image data

Get image data loop

No for 3 times

Get image data from camera module

Send FBUF CTRL command to resume normal video state

Appendix B: Communication example for getting an image

Below is the example for how to get a QVGA image by UART @ baud rate 57600bps and higher compression ratio.

Set UART baud rate 57600bps

SET BAUD RATE
56 00 31 06 04 02 00 08 1C 4C

COM REPLY
76 00 31 00 00

Set image format size to QVGA

SET SAMPLE SIZE
56 00 31 05 04 01 00 19 11

COM REPLY
76 00 31 00 00

Set image compression ratio to 0x50

SET COMPRESSIONRATIO
56 00 31 05 04 01 00 1A 50

COM REPLY
76 00 31 00 00

SYSTEM RESET
56 00 26 00

COM REPLY
76 00 26 00 00

Delay

Stop at current frame

FBUF CTRL
56 00 36 01 00

COM REPLY
76 00 36 00 00

GET FBUF LEN
56 00 34 01 00

Current frame size is 25D4 h

COM REPLY
76 00 34 00 04 00 00
25 D4

READ FBUF
56 00 32 0C 00 0A
00 00 00 00 00 00
25 D4 10 00

Image size is 0x012C00, data delay time is 1000*01 = 10ms

COM REPLY
76 00 32 00 00

Get image data starting

Image data

Get image data, size 25D4h

COM REPLY
76 00 32 00 00

Get image data ending

Resume normal video state

FBUF CTRL
56 00 36 01 03

COM REPLY
76 00 36 00 00

The image data we got from ITV-GECWV408M by performing the above operations is indicated as below:

FF D8 FF FE 00 24 DA 0E 6C 96 00 00 00 00 00 00 00 00 00 00 00 00 00 00 F0 00 40 01 7F 00 32 12 0B 51 04 51 04 00 00 FF DB 00 84 00 20 16 18 1C 18 14 20 1C 1A 1C 24 22 20 26 30 4F 34 30 2C 2C 30 61 45 49 3A 4F 73 65 79 77 71 65 6F 6D 7F 8F B7 9B 7F 87 AD 89 6D 6F 9F D8 A1 AD BD C2 CC CE CC 7B 99 E0 F0 DE C6 EE B7 C8 CC C4 01 22 24 24 30 2A 30 5D 34 34 5D C4 83 6F 83 C4 C4 C4 C4 C4 C4 C4 C4 C4 C4 C4 C4 C4 C4 C4 C4 C4 C4 C4 C4 C4 C4 C4 C4 C4 C4 C4 C4 C4 C4 C4 C4 C4 C4 C4 C4 C4 C4 C4 C4 C4 C4 C4 C4 C4 C4 C4 C4 C4 C4 FF FE 00 05 00 00 00 FF C0 00 11 08 00 F0 01 40 03 01 21 00 02 11 01 03 11 01 FF C4 01 A2 00 00 01 05 01 01 01 01 01 01 00 00 00 00 00 00 00 00 01 02 03 04 05 06 07 08 09 0A 0B 01 00 03 01 01 01 01 01 01 01 01 01 00 00 00 00 00 00 00 01 02 03 04 05 06 07 08 09 0A 0B 10 00 02 01 03 03 02 04 03 05 05 04 04 00 00 01 7D 01 02 03 00 04 11 05 12 21 31 41 06 13 51 61 07 22 71 14 32 81 91 A1 08 23 42 B1

…………

6F C2 90 8C 99 10 C6 E5 1B A8 AB 76 77 38 22 39 0F 1F C2 69 8C BF 54 6E EC F2 4C 91 0E 7B AD 21 12 5A D9 88 B0 F2 61 9F B7 A0 AB 74 0C 28 A0 42 D1 40 10 5C CE 61 50 42 16 CF E5 51 5D 28 9E 01 2C 64 9C 73 8C FF 00 9E 68 00 CF DA ED 3D 64 5F E7 FF 00 D7 A4 83 FD 22 CD A2 FE 25 E9 FD 29 8C 48 0F 9D 65 24 7F C4 BD 07 EA 29 10 F9 9A 73 8F EE E7 FC 68 00 63 9D 34 7B 1C 7E B5 66 03 8B 64 3E 8B 48 07 02 A7 B5 41 7E D8 83 1E A4 50 22 39 FF 00 77 66 89 DC E2 96 5F DC 59 85 1C 33 53 01 50 0B 7B 6D C7 EF 1A 4B 44 2A 1A 57 3D 68 01 F0 DC 79 AE CB B7 81 D0 D4 F4 80 28 A0 04 A2 80 3F FF FF FF **FF D9**

To verify the correctness of the image data, we can see the data starting at **FF D8** and ending at **FF D9**. It tells us that this is the correct image data. Then follows procedures below, we can get an integral image:

1. create a file and name it as XXX.JPG
2. put the correct image data into it
3. save the file

Performs the above operation, the image is shown as below: