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—— Serial camera module (Data sheet)

Datasheet (Version 1.1)

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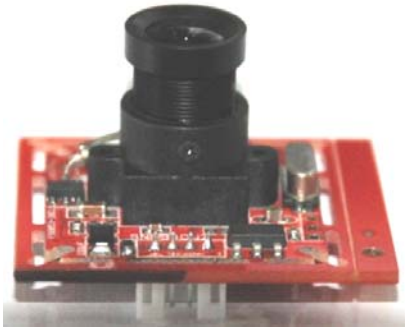
Overview

What is ZM serial camera module ——



The ZM 0.3 Mpixel serial JPEG still camera module as Quick Zoom basic product is provided ZM technology with highly integrated, so as to meet a lot of embedded system's acquisition imaging that is JPEG compressed format and it's more convenient data transimission in the low-speed channel condition.

Image sensor

Adopting the advanced version of OmniVision CMOS VGA colour sensor on-board making overall unit a low powered comsuption, and good quality of image. via RS232, RS458, TTL, etc. serial interface attached external host system's UART port etc.

Connector

its build-in a 4-wire connector, four different colour have correlatively stand for 4 wire function

Red:	power line
Yellow:	RX line
Green:	TX line
Black:	GND line

LED chip

On-board LED chip, once the PCB is provided power or the camera do a snapshot, the LED chip will come a sparkle which indicate operating .

Features

The ZM 0.3 Mpixel serial JPEG still camera module compact size, low power comsuption, more stable operation. 5.0V DC Supply. UART: Up to 115200bps for transterring JPEG images. the advanced OmniVision OV7725 VGA colour sensor JPEG CODEC for different resolutions. with down sampling, clamping and windowing circuits for VGA, QVGA, and with out external DRAM required.

Applications

- Embedded systems for imaging acquisition and control
- Security and Control systems,
- Remote or public monitoring.
- Retrieved/object detection and recognition.
- Industrial control, vehicle and medical systems.
- Etc.

Summary Description

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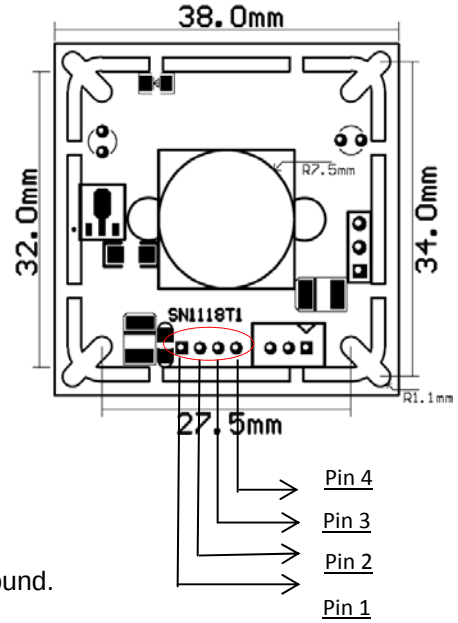
Pin Description



VCC pin 1 (Supply Voltage Input):
Voltage input supply pin 1, this pin must be connected to a regulated voltage.RS232/ 485,TTL: 4.5V to 6.5V DC range, nominal 5.0V.

RX pin 2 (Serial Receive):
Asynchronous Serial port Receive pin 2, (RX). which connect to host Serial Transmit (Tx) signal. and the host transmits data to the module via this pin.

TX pin 3 (Serial Transmit):
Asynchronous Serial port Transmit pin 3, (TX). which connect to host Serial Receive (Rx) signal. and host receives data from the module via this pin.

GND pin 4 (Ground):
Module ground pin 4. This pin must be connected to the ground.

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Communication Protocol details

——ZM 0.3Mpixel Serial Interface Camera

Notice:

1. This protocol applies to 0.3 Mega pixels, 1.3 Mega pixels and 5.0 Mega pixel Camera;
2. This protocol applies to RS485, RS232 and TTL camera;
3. The camera ID is always “zero” for RS232 and TTL camera.

The information in this manual was current when published. The manufacturer reserves the right to revise and improve its product. All specifications are therefore subject to change without any notice.

1. General Description

ZM Serial Camera series has a standard RS232/RS485 interface; it supports RS232 and TTL input/output signals and can connect to PC or any other device with RS232/RS485 interface. The communication speed (baud rate) can be set as 2400 bps, 9600bps, 14400 bps, 19200bps, 38400bps, 57600bps, 115200pbs (default value).

2. Data Frame Type

There are three types of data frame transmitting between camera and host, they are: Command Frame, ACK/NAK Frame and Data Frame.

Structure of command frame:

Data Header "U" (1byte)	Command Byte (1byte)	Camera ID (1byte)	Command Content (0——n bytes)	"#" (1byte)

Notice: 1. The details of command byte advised in chart 1.
2. The length of command content is subject to specific command byte.
3. Camera ID varies from 0 to 33. If the command is 0xff, the firmware performs it immediately.
4. The command frame is used to set the working status of serial camera and start up snapshotting.

Structure of ACK/NAK frame

ACK

Data Header "U" (1byte)	Received Command Byte (1byte)	Camera ID (1byte)	"#" (1byte)

An ACK will be sent out by receiver after receiving expected (correct) commands frame.

NAK

Data Header "U" (1byte)	? (1byte)	Camera ID (1byte)	"#" (1byte)

A NAK will be sent out by receiver after receiving unexpected command or failing to process incoming command.

Structure of data frame

Data Header "U" (1byte)	Command Byte "F" (1byte)	Camera ID (1byte)	Image Data (Max. 1028bytes)	Check Code (2bytes)

Package ID (1byte)	Package Length (Max. 2bytes)	Connect of Image Data (Max. 1024bytes)

Notice:

(1) All data transmits from LSB;
(2) All package size except the last one equals to the one set by snapshot command, the last one varies for different image.
(3) Check sum equals to the sum of the whole package data except the check sum field(from U to the byte before check sum field)

3. Command Instruction

△Chart 1

Command Byte	Command Content	Description	Example
I	Change the baud rate of camera '0' represents 9600 '1' represents 19200 '2' represents 38400 '3' represents 57600 '4' represents 115200 '5' represents 2400 '6' represents 14400	Host issues this command to change the baud rate of camera, and an ACK will be sent out by camera after receiving incoming command. Camera will keep using this changed baud rate to communicate with host in the sequent communication processing.	UI 01 3# Hexadecimal representation （55 49 01 33 23 ） Change the baud rate of no.1(camera ID) camera to 57600, and camera responds "UI 01 # (55 49 01 23)" to host after receiving incoming command
H	1Byte : Image(Picture) size 1：160×128 pixel 2：320×240 pixel 3：640×480 pixel 4: 1280X1024 pixel (the last one is used for 1.3megapixel camera) 2Bytes: package size (hexadecimal representation)	Host issues this command for requesting camera to snapshot a picture of specified size and divide it into packages according to directed size, and "UH # " responded by camera after receiving incoming command.)	UH 0x01 2 0x00 0x02 # Hexadecimal representation （55 48 01 32 00 02 23） No.1 （camera ID） camera snapshots a picture with size 320x240 and divide it into packages according to the size of 512 bytes
R	4Bytes: Snapshot size (hexadecimal representation) 2Bytes: number of data packages (hexadecimal representation)	Camera issues this command to report the size of the snapshot and the number of data packages	UR 0X01 0x00 0x5C 0x00 0x00 0x2E 0x00 # Hexadecimal representation （55 58 01 00 5C 00 002E 00 23） "00 5C 00 00" these 4bytes represents snapshot size "2E 00" these 2bytes represents the number of data packages No.1 （camera ID） camera reports the picture data size is 23K and the number of data packages is 46

E	2bytes: package ID (hexadecimal representation)	Host issues this command to camera for getting the package with desired package ID	U E 0X01 0x2E 0x00 # Hexadecimal representation（55 45 01 2E 00 23） Get the package with package ID 46 from No. 1 camera
F	2bytes: package ID (hexadecimal representation) 2Bytes:Package Size (hexadecimal representation, without including the fields of package ID and check sum) n Bytes : Image Data 2Byte: Check Sum (the sum of the whole package data except the check sum field)	Camera transmits the data of specified package to host	UF 0X01 0x2E 0x00 0x00 0x02 .....Data Content..... 0x1E 0x13 Hexadecimal representation (55 46 01 2E 00 00 02+image data+check sum） No.1 camera transmits the package with package ID 46, package size is 512 and check sum is 1E13.
D	1Byte: The changed camera ID (hexadecimal representation)	Host issues this command to change the ID No. of camera	UD 0x01 0x02 # Change the ID No. of camera from 1 to 2 UD 0xFF 0x02 # All the ID no. will be changed to 2 after cameras receiving this command
Q	Set the compression ratio of camera, it can vary from 20 to 250 (this command is not suitable for 0.3megapixel camera, only available for 1.3 & 5.0 mega pixel camera) Note: 1. Defaulted compression rate is 150 or 160 2. Higher compression rate means smaller size picture, but the picture quality is not as good as the one captured under lower compression rate	Set the compression rate: For example: Host issues command: UQ 01 30# Camera responds: UQ 01#, it means the compression rate is set success	UQ 01 30#(55 51 01 30 23) Change the compression rate of No.1 camera to 30 Camera responds (ACK command): UQ 01 #(55 51 01 23)

Notice: All letters are capitalized, and command can be represented as hexadecimal.

5. Receiving Data Rule

Judging the received data frame correct or not, just need to check its length.

E.g.

"R" data frame: 10 bytes:
1byte ('U') +1byte ('R') +1byte(Camera ID No.) +4bytes (Image Size) +
2bytes(Quantity of sub-package) +1byte('#');

"E" command frame: 6 bytes:
1byte ('U') +1byte ('E') +1byte (Camera ID No.) +2bytes (Package ID) + 1byte ('#');

"F" command frame: 9+N bytes, "N" means the quantity of byte of image data
1byte ('U') +1byte('F') +1byte(Camera ID No.) + 2bytes (package ID) +
2bytes (size of valid data in this package)+ N bytes(content of image data in this package)
+ 2bytes (check sum field);

6. Communication Processing between Camera and Host

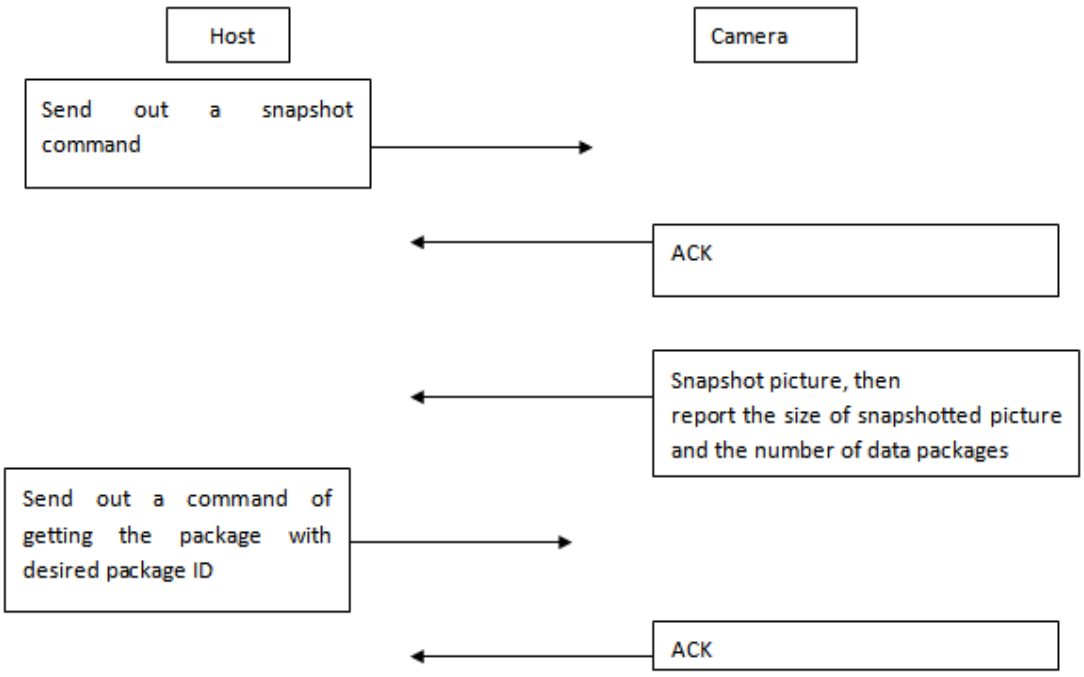
Notice for communication of 0.3 Mega pixels Camera:

1. The camera should be initialed after power on, and it takes about 2S to complete the initialization.
2. The consumed time of snapshotting: it takes T_p to snapshot a picture after camera receiving the snapshot command. The min. of T_p is 200ms is that when takes a white-black picture.

Notice for communication of 1.3 Mega pixels Camera:

1. The camera should be initialed after power on, and it takes about 16S-30S to complete the initialization.
2. The consumed time of snapshotting: it takes T_p to snapshot a picture after camera receiving the snapshot command. The min. of T_p is 150ms, if the current picture size is not the expected one which will be snapshotted, the configuration of camera should be reset, and then, the T_p is about 3s.

Snapshot a single picture（snapshot a picture of specified size）



Transmits data of specified package

E.g.

Host requests to snapshot a picture with size 160x128 from no.1 (camera ID) camera:

[1] Host sends out snapshot command as follows:

UH 0x01 1 0x00 0x02 #（55 48 01 32 00 02 23） //(snapshot a picture with size 160X128, and divide it into packages with size 512bytes.)

ACK from camera：

UH 0x01 #（55 48 01 23 ） //ACK command frame

Then camera reports the information of the snapshotted picture (image) data:

UR 0x01 0x74 0x0A 0x00 0x00 0x06 0x00 # //snapshot size is 2676bytes, number of packages is 6 .

(2) Host sends out command of getting the package with desired package ID：

UE 0x01 0x01 0x00 #（55 45 01 01 00 23 ） //Request to get the data of first package

ACK from camera：

UE 0x01 #（55 45 01 23 ）

And then camera transmits the data of first package as follows:

//UF the first package 520bytes

5546010000002FFD8FFE000114A46494600010203040506070809 0AFFDB004300100C0C0E0C0A100E0E0E1212101
418281A181616183224261E283A343E3C3A34383840485C4E4044584638385 06E525860626868683E4E727A7064
785C666864FFDB00430112121216161630 1A1A3064423842646464646464646464646464646464646464646464
6464646464646464646464646464646464646464646464646464646464646464FFC4001F000001050101010101010000000
0000000000010203040506070809 0A0BFFC400B5100002010303020403050504040000017D0102030004110512
213141061351610722711432819 1A1082342B1C11552D1F02433627282090A161718191A25262728292A343536
3738393A434445464748494A535455565758595A636465666768696A737475767778797A838485868788898A929
39495969798999AA2A3A4A5A6A7A8A9AAB2B3B4B5B6B7B8B9BAC2C3C4C5C6C7C8C9CAD2D3D4D5D6D7D8D9D
AE1E2E3E4E5E6E7E8E9EAF1F2F3F4F5F6F7F8F9FAFFC4001F0100030101010101010101010000000000000102030
405060708090A0BFFC400B51100020102040403040705040400010277000102031104052131061241510761711 3
22328108144291A1B1C109233352F0156272D10A162434E125F11718191A262728292A35363738393A43444546
4748494A535455565758595A6364650006

//check sum

Host sends out：

UE 0x01 0x02 0x00 #（55 45 02 02 00 23 ） // Request to get the data of second package

ACK from camera：

UE 0x01 #（55 45 02 23 ）

And then camera transmits the data of second package ：

//UF the second package 520bytes

5546020000027475767778797A828384858687888 98A92939495969798999AA2A3A4A5A6A7A8A9AAB2B3B4B5B
6B7B8B9BAC2C3C4C5C6C7C8C9CAD2D3D4D5D6D7D8D9DAE2E3E4E5E6E7E8E9EAF2F3F4F5F6F7F8F9FAFFC00011
08008000A00301220002110103110 1FFDA000C03010002110311003F00E934E9231690CED1992793BE31C67078F
A7F2AD6B70CB028906D6F4CD430C969112B16010013807BF23F9D5A2096539E9DBD686F4B19A168A28A4329EA
881EC1FD8823F3AE4EE5765C230E3A1CFE35D8DE2EEB4917D4572B78A08FC3FAD6B4C3A0CD5154EB12EC5DB8C
2E07183B40FE75DA57157EE1AF9A41DC293F5DA33FAD749A35CACFA7A26ECBC636B0F41938FD289AD0465B851
E32DCD8C6E03F1F2C549E27404DA7FC0FF00F65A86E7E5F150247FCB58C7FE3AB56BC46326D7FE05FD28EA85D6

E6ED14515914145145001451450067EB480E9539F61FCC566D94132F877308CB3B17EA38C1F7FA569EB4C069536
7BE00FCC553824F2BC2523E718864C7D7271557B442C72167034BA836D1911C65DBD8703FA8A76A134912208D
B05B3938AB5A3286BAB894A6E0A00FBD8EA7FF00AD5775482D255791A3C4D818393FFEAABBDF40EA58D37505
9ED0DC344864023DC79F9B8C7D076ED5D4D725E1CB6173A7C60270010ED9E9F313FD2BAC1850173CE2A256B21
585A28A2A464738DD0B0AE4EEFA0FF76BB0EA2B9900F4 //check sum

……

Host sends out:

UE 0x01 0x06 0x00 #（55 45 01 06 00 23 ） // Request to get the data of the last package(the sixth package)

ACK from camera:

UE 0x01 #（55 45 01 23 ）

And then camera transmits the data of the sixth package:

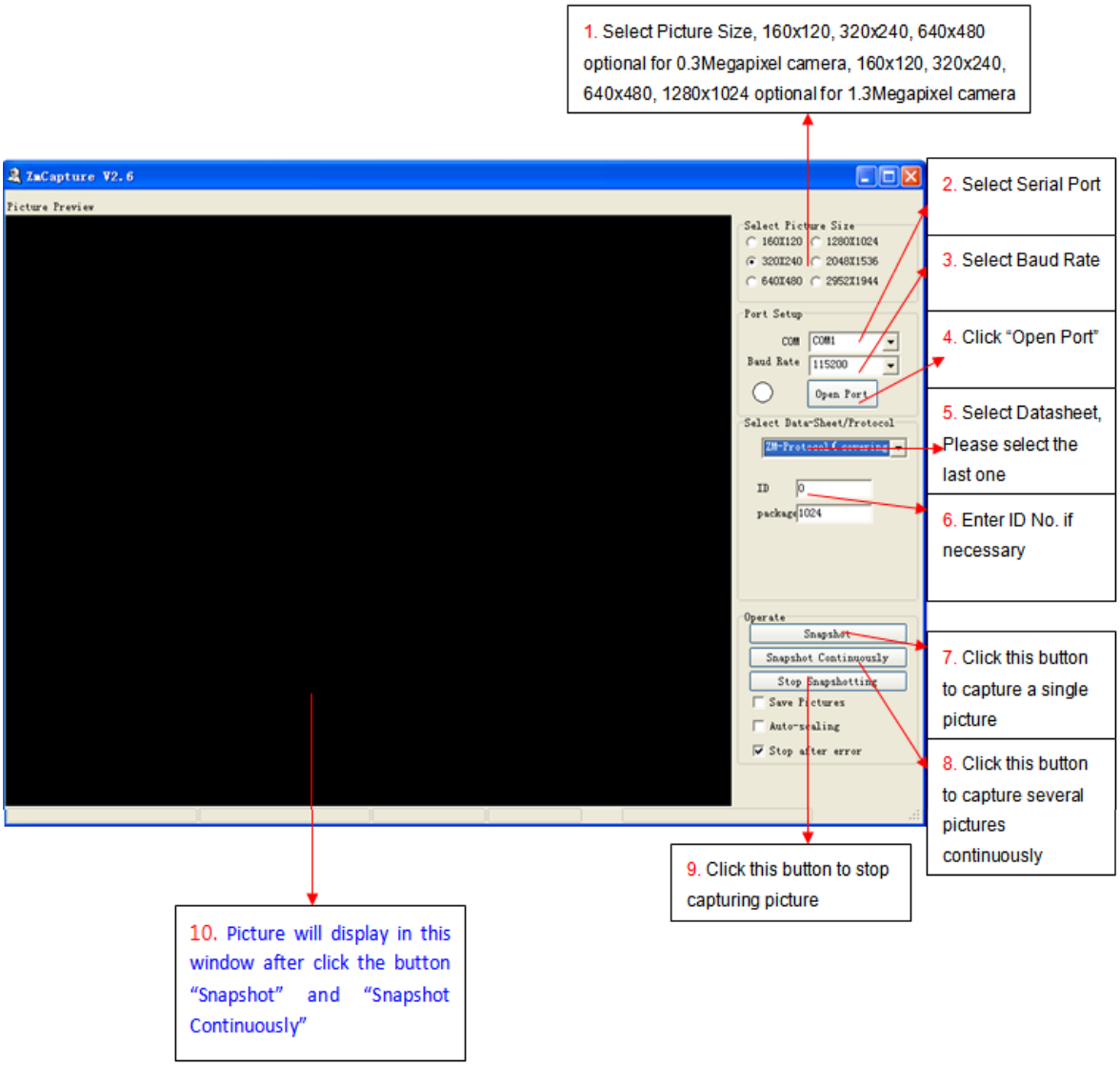
//UF the sixth package 116bytes

（ the last package is not full of 512bytes, the actual size is 1801 ）

55460600180169348 4D20026909A696A4C93484422A1B9E262C380DC8A941A528B201B8E00AAB8342DC6A97B7
9FEBEE1DC7A741F9557DCCDD4D5B48ADD4648DC7D2A749E341F2C23FEFAA134B61599452091FEEA1356134D9
DFAA85AB1F6C973F290A3D00A63CAF21CBB1345C761DFD98B1F32CC00F4C54A21B28C6465CFD0D57CD2E695D
8EC59F3D02E16203F1A8CCAC7BFE951668CD21D87E68CD33346EA007E69334C2D49BA8B8126EA6934DC934633
45C2C05A93934E0B4F0940116DA50952EDC518A0928034A0D301A5069B192034A0D301A5CD202406941A8F751
BA8192E6973516EA50690C97349BA9A3EB4A0501617752649A705A784A03423C5382D481453B02815C88253C2
629F8A3140AE3714B4B8A5E2810DC518A7710188 //Check Sum

All data is transmitted to host according to the above way.

PC test Demo


1. Select Picture Size, 160x120, 320x240, 640x480 optional for 0.3Megapixel camera, 160x120, 320x240, 640x480, 1280x1024 optional for 1.3Megapixel camera
ZmCapture V2.6
Picture Preview
Select Picture Size
160X120
1280X1024
320X240
2048X1536
640X480
2952X1944
Port Setup
COM
COM1
Baud Rate
115200
Open Port
Select Data-Sheet/Protocol
ID
0
package
1024
Operate
Snapshot
Snapshot Continuously
Stop Snapshotting
Save Pictures
Auto-scaling
Stop after error
2. Select Serial Port
3. Select Baud Rate
4. Click "Open Port"
5. Select Datasheet, Please select the last one
6. Enter ID No. if necessary
7. Click this button to capture a single picture
8. Click this button to capture several pictures continuously
9. Click this button to stop capturing picture
10. Picture will display in this window after click the button "Snapshot" and "Snapshot Continuously"