

# **PC Camera Controller**

## **SN9C102P Data Sheet**

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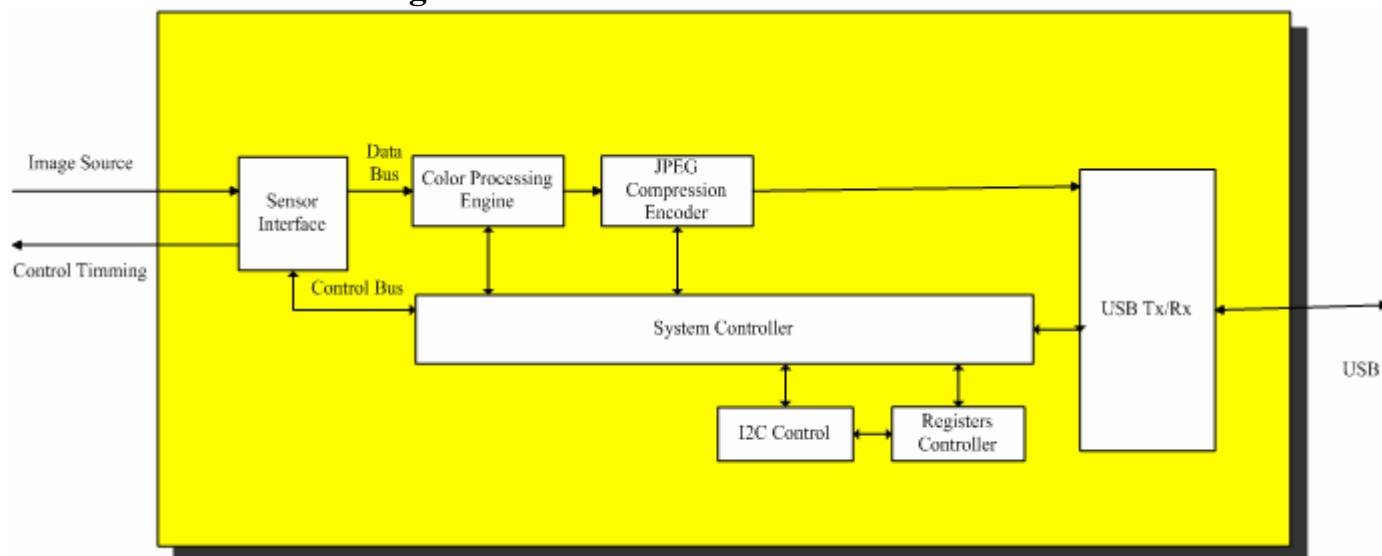
## **1. General Description**

The SN9C102P is a video single-chip processor to pair with the resolution of VGA or CIF CMOS image sensor. It reads the 9 or 8 bits input raw image data (RGB Bayer pattern) from an image device and outputs through a USB port into the PC. This chip includes three individual digital color gains setting (named R, G, B gains), H/W color and JPEG compression engine, offset compensation, hardware windowing with random image size selection, and scaling functions.

## **2. Features**

- 9-Bit CMOS image raw data input
- Up to 30fps@VGA for PC mode video
- Provide individual R/G/B digital color gains control
- Provide snapshot function
- Support pixel offset compensation
- Support CIF/VGA CMOS sensor, IC-media, TASC 5110/5130, Hynix 7131D/E/R, OmniVision, Pixart 106/202, Micron, NS, CI sensor, ... etc
- Embedded two modes of AE calculation and report
- Built-in external EEPROM controller for customer V\_ID, P\_ID, defect pixel compensation and streaming setting
- Provide internal up to 26 various P\_ID in default setting
- Provide hardware windowing, 1/2, 1/4 scaling function with smooth filter
- Built-in gamma correction and white balance gain circuit
- Support operation mode in image quality/frame rate selection
- USB 1.1 compliance and support suspend mode
- USB 4 endpoints: control, isochronous read, bulk read, and interrupt read
- Support video data transfer either in USB isochronous or bulk modes
- Up to 9 alternated setting for USB isochronous transfer of video data
- 12MHz crystal and 3.3 volt only
- 48 pins LQFP package
- Embedded hardware color DSP and JPEG baseline capability of compression encoder
- No external memory needed

### 3. Functional Block Diagram



### 4. Pin Assignment

SN9C102P	PIN NAME	DIR	Description
1	GPIO2	B	General purpose I/O
2	NC		
3	NC		
4	PID_SEL2	I	Product ID selection (H,L,Z)**
5	PID_SEL1	I	Product ID selection (H,L,Z)**
6	PID_SEL0	I	Product ID selection (H,L,Z)**
8	KEY	I	KEY input
9	RST	I	chip reset
10	NC		
11	NC		
12	AVDD	P	VDD for analog part
13	AVSS	P	GND for analog part
14	TAVSS		GND for USB
15	DN	B	D- for USB
16	DP	B	D+ for USB
17	TAVDD	P	VDD for USB
18	GPIO0	B	General purpose I/O
19	GPIO1	B	General purpose I/O
20	TEST	I	test mode
21	S_PWR_DN	O	Power down for sensor
22	LED	O	LED output
23	VDD	P	VDD for core and I/O
24	GND	P	GND for core and I/O

25	SDA	B	I2C data
26	SCL	O	I2C clock
27	S_PCK	B	Sensor pixel clock
28	VDD	P	VDD for core and I/O
29	GND	P	GND for core and I/O
30	SEN_CLK	O	Sensor clock
31	S_VSYNC	B	Sensor vsync
32	S_HSYNC	B	Sensor hsync
33	S_IMG0	B	Sensor image data
34	S_IMG1	B	Sensor image data
35	S_IMG2	B	Sensor image data
36	S_IMG3	B	Sensor image data
37	GND	P	GND for core and I/O
38	VDD	P	VDD for core and I/O
39	S_IMG4	B	Sensor image data
40	S_IMG5	B	Sensor image data
41	S_IMG6	B	Sensor image data
42	S_IMG7	B	Sensor image data
43	S_IMG8	B	Sensor image data
44	VDD	P	VDD for OSC
45	XIN	I	OSC input
46	XOUT	O	OSC output
47	GND	P	GND for OSC
48	NC		

## 5. Electrical Characteristics

### 5.1 DC Operating Condition

#### a. Absolute maximum ratings:

Symbol	Parameter	Rating	Units
Vcc	Power Supply	-0.3 to 3.6	V
Vin	Input Voltage	-0.3 to Vcc+0.3	V
Vout	Output Voltage	-0.3 to Vcc+0.3	V
Tstg	Storage Temperature	-55 to 150	°C

#### b. Recommended operating conditions:

Symbol	Parameter	Min	Typ	Max	Units
Vcc	Power Supply	3.0	3.3	3.6	V
Vin	Input voltage	0		Vcc	V
Topr	Operating Temperature	0		70	°C

#### c. DC electrical characteristics:

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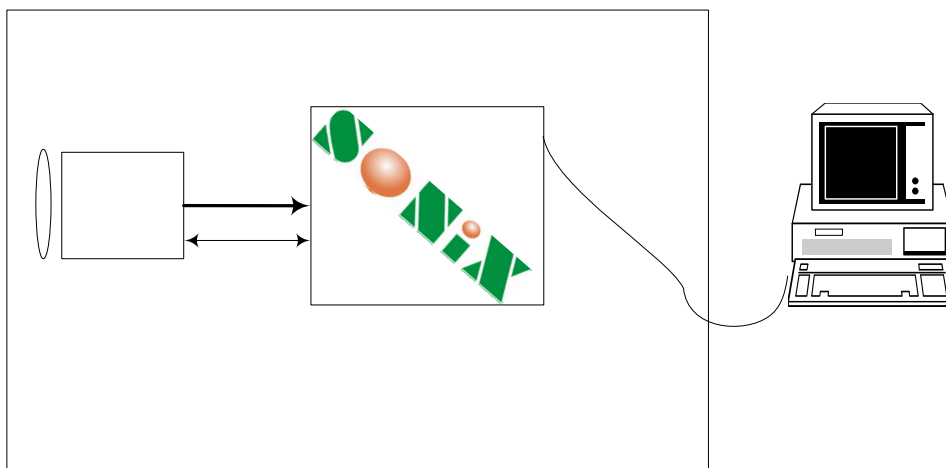
(Under Recommended Operating Conditions and  $V_{cc}=3.0 \sim 3.6V$ ,  $T_j=0$  to  $+115^{\circ}C$ )

Symbol	Parameter	Conditions	Min	Typ	Max	Units
Vil	Input low voltage	CMOS	-0.3		$0.3V_{cc}$	V
Vih	Input high voltage	CMOS	$0.7V_{cc}$		$V_{cc}+0.3$	V
Vil	Input low voltage	TTL	-0.3		0.8	V
Vih	Input high voltage	TTL	2.0		5.3	V
Iil	Input low current	no pull-up or pull-down	-1		1	$\mu A$
Iih	Input high current	no pull-up or pull-down	-1		1	$\mu A$
Ioz	Tri-state leakage current		-1		1	$\mu A$
Vil	Schmitt input low voltage	CMOS		1.20		V
Vih	Schmitt input high voltage	CMOS		2.10		V
Vol	Output Low voltage	$I_{ol}=4mA$			0.4	V
Voh	Output high voltage	$I_{oh}=4mA$	2.4			V
Cin	Input capacitance			2.8		pF
Cout	Output capacitance		2.7		4.9	pF
Cbid	Bi-directional buffer Capacitance		2.7		4.9	pF

## 5.2 AC Operating Condition

Symbol	Description	Max operation Frequency	Notes
SEN_CLK	Sensor clock	48MHz	
XIN	Crystal input clock	12 MHz	
SCK	I2C clock frequency	400KHz	

## 6. System Applications



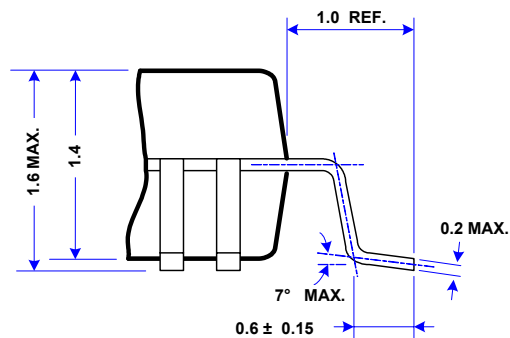
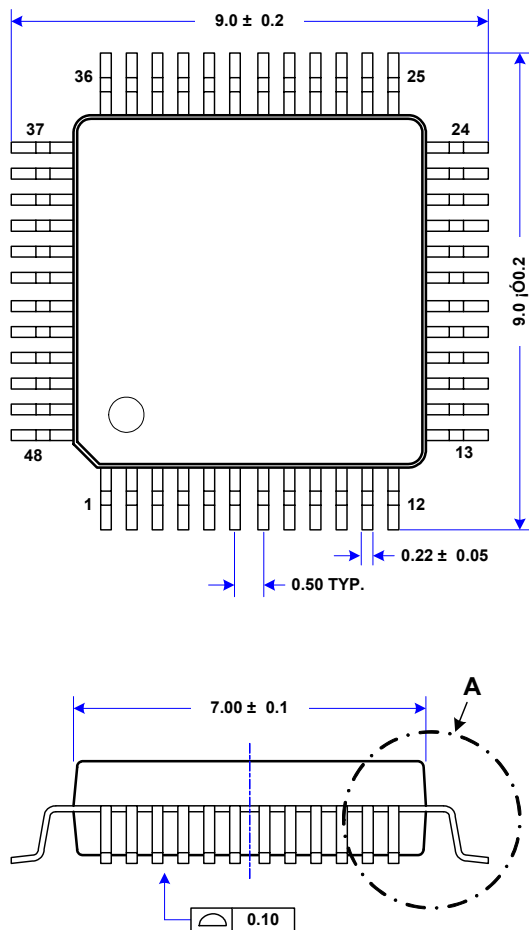
The schematic diagram illustrates the internal circuitry of the SN9C102P EVB. Key components include:

- ICs:** U1 (SN9C102P), U2 (\*24C02/SO8), U3 (\*AT1201X), U4 (F16 VAD AIC1732-33).
- Connectors:** J1 (USB CONNECTOR), J2 (HEADER 3), J3 (JUMPER), J4-J8 (VDD\_ASIC headers).
- Power Regulation:** L3 (4.7µH), C12-C15 (10µF/0805), L6, L7 (4.7µH), M1 (STARTPOINT3), AVSS.
- Sensors and Interfaces:** JP1 (SENSOR INTERFACE), JP2 (JP2), JP3 (JUMPER), JP4 (GPIO\_0/GPIO\_1 header).
- Other Components:** B1-B6 (capacitors), R1-R9 (resistors), SW1 (SW KEY), LED1 (LED(HT-107)).

The diagram shows the connection between the microcontroller (U1) and various peripheral devices, power supply rails (VDD\_ASIC, VDD\_SEN, AGND, AVSS), and user-accessible points like headers and jumpers.

## 8. Package Information

- 48pin LQFP



**DETAIL VIEW A**

(All dimensions are in Millimeters)