SN9C101 Specification

PC Camera Controller

Released Vision 1.3

Revision Number	Date	Description
0.9	Feb. 2002	A brief specification and release to marketing
1.0	May 2002	Add cover sheet and release to agents
1.1	Oct. 2002	Add the operation current in electric characteristic
1.2	Feb. 2003	A formal specification and release to customers
1.3	Oct. 2003	USB bandwidth setting and register description

PC Camera Controller

1. General Description

The SN9C101 is a single-chip PC camera controller. It is specifically designed for pairing with the CIF grade of CMOS image sensor and provides pin to pin compatible with SN9C102. This chip includes a preliminary color processing engine, an image compression engine, and an USB interface controller. The SN9C101 can directly transmit the image data into the USB port without any extra memory support. Its special designed architecture makes this chip suitable for extra low cost USB PC camera application.

2. Features

- Focus on CIF resolution of CMOS image sensor
- Pin to pin compatible with SN9C102
- Up to 30fps at CIF format
- Provide preliminary color processing engine to enhance the frame rate
- Provide two general programmable I/O pins
- Provide hardware windowing and panning function
- USB 1.1 compliance and support suspend mode
- The bandwidth of Iso-chronous pipe can be automatic selected (0, 128, 256, 384, 512, 680, 800, 900, 1023)
- Up to 8 various P_ID in applications
- 12MHz crystal and 3.3Volt only
- 48 pins LQFP package

3. Pin Description

Number	NAME	I/O	Description
1	NC		
2	VDD	I	VDD for core
3	PID_SEL2	I	Product ID selection
4	PID_SEL1	I	Product ID selection
5	PID_SEL0	I	Product ID selection
6	GND	I	GND for core
7	NC	I	
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	P	GND for USB part
15	DN	B	D- for USB
16	DP	B	D+ for USB
17	TAVDD	P	VDD for USB part
18	GPIO_0	B	General purpose I/O
19	GPIO_1	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
24	GND	P	GND for core
25	SDA	B	I2C data
26	SCL	O	I2C clock
27	S_PCK	B	Sensor pixel clock
28	VDD	P	VDD for core
29	GND	P	GND for core
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
38	VDD	P	VDD for core
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	VDDAP	P	VDD for PLL
45	XIN	I	OSC input
46	XOUT	B	OSC output
47	VSSAP	P	GND for PLL
48	NC		

I : input pin , O : output pin , B : bi_direction pin , P : power pin .

4. Electrical Characteristics

4.1 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:

(Under Recommended Operating Conditions and Vcc=3.0 ~ 3.6V , Tj=0 to +115 °C)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
Vil	Input low voltage	CMOS	-0.3		0.3Vcc	V
Vih	Input high voltage	CMOS	0.7Vcc		Vcc+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	uA
Iih	Input high current	no pull-up or pull-down	-1		1	uA
Ioz	Tri-state leakage current		-1		1	uA
Vil	Schmitt input low voltage	CMOS		1.20		V
Vih	Schmitt input high voltage	CMOS		2.10		V
Vol	Output Low voltage	Iol=4mA			0.4	V
Voh	Output high voltage	Ioh=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

4.2 AC Operating Condition

Symbol	Description	Max operation Frequency	Notes
SEN_CLK	Sensor clock	24MHz	
XIN	Crystal input clock	12 MHz	
SCK	I2C clock frequency	400KHz	

4.3 Operation Current:

(Under Recommended Operating Conditions and Vcc=3.3V , Tj=25 °C)

Condition	Typical	Maximum	Unit
CIF@30fps	20		mA
QVGA@30fps	20		mA
Suspend	10	50	uA

5. USB interface

5.1 Endpoint description

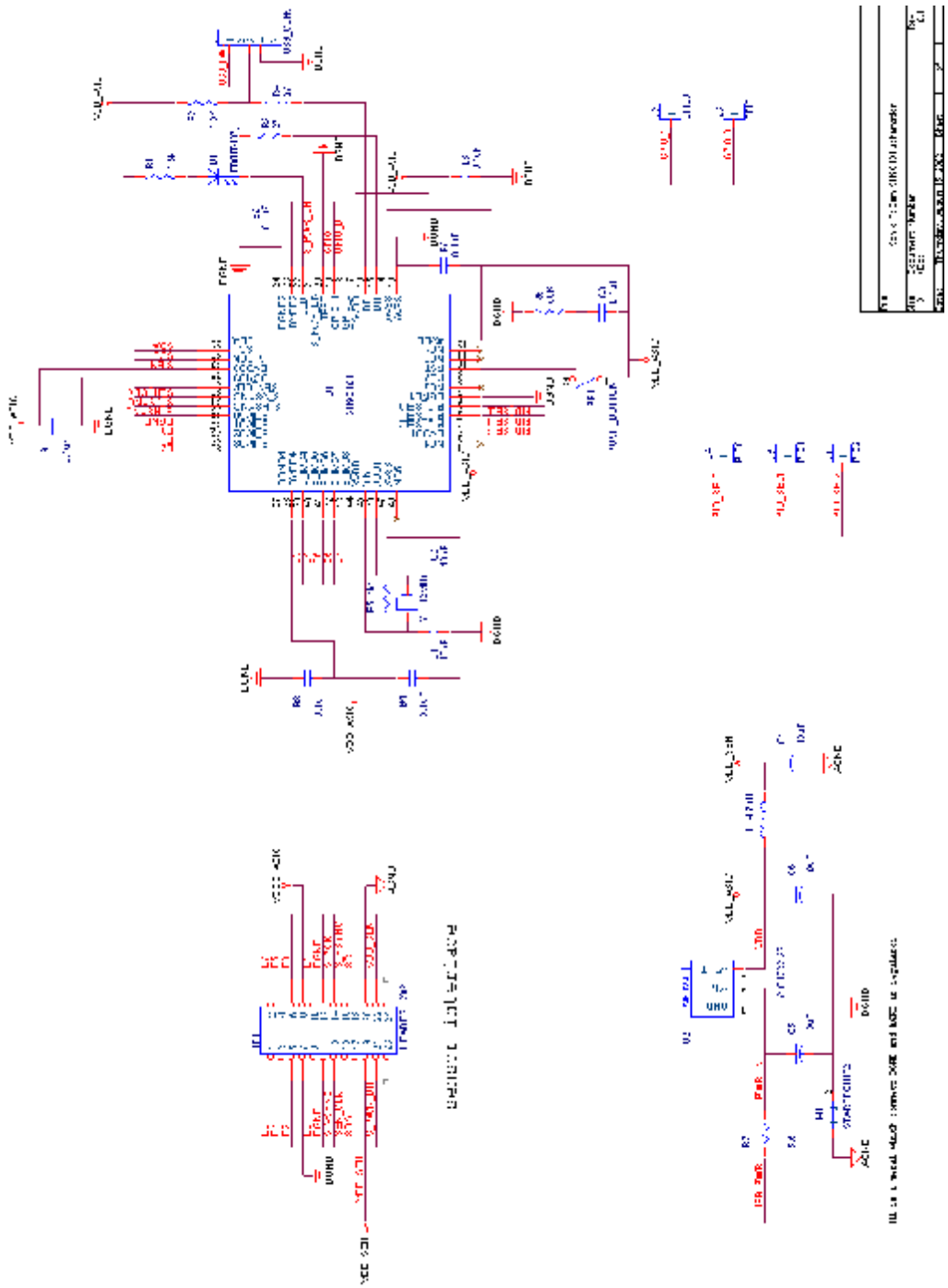
Endpoint #	Function	Transfer Type	MaxPsz (byte)
0	STD Commands	Control	64
1	ISO Read	Isochronous	0, 128, 256, 384, 512, 680, 800, 900, 1023
2	Bulk Read	Bulk	64
3	Interrupt Read	Interrupt	1

5.2 Descriptor Table Data

Device	12 01 **10 01 00 00 00** 40 VL VH PL PH **01 01 00 01** 00 01
Configuration	09 02 17 01 01 01 00 **80 fa**
String	16 03 **55 00 53 00 42 00 20 00 63 00 61 00 6d 00 65 00 72 00 61 00**
Alternate Setting = 0	
Interface 0	09 04 00 00 03 **ff ff ff** 00
Endpoint 1	07 05 81 01 00 00 01
Endpoint 2	07 05 82 02 40 00 00
Endpoint 3	07 05 83 03 01 00 **64**
Alternate Setting = 1	
Interface 0	09 04 00 01 03 **ff ff ff** 00
Endpoint 1	07 05 81 01 80 00 01
Endpoint 2	07 05 82 02 40 00 00
Endpoint 3	07 05 83 03 01 00 **64**
Alternate Setting = 2	
Interface 0	09 04 00 02 03 **ff ff ff** 00
Endpoint 1	07 05 81 01 00 01 01
Endpoint 2	07 05 82 02 40 00 00
Endpoint 3	07 05 83 03 01 00 **64**
Alternate Setting = 3	
Interface 0	09 04 00 03 03 **ff ff ff** 00
Endpoint 1	07 05 81 01 80 01 01
Endpoint 2	07 05 82 02 40 00 00
Endpoint 3	07 05 83 03 01 00 **64**
Alternate Setting = 4	
Interface 0	09 04 00 04 03 **ff ff ff** 00
Endpoint 1	07 05 81 01 00 02 01
Endpoint 2	07 05 82 02 40 00 00
Endpoint 3	07 05 83 03 01 00 **64**
Alternate Setting = 5	
Interface 0	09 04 00 05 03 **ff ff ff** 00
Endpoint 1	07 05 81 01 a8 02 01
Endpoint 2	07 05 82 02 40 00 00
Endpoint 3	07 05 83 03 01 00 **64**

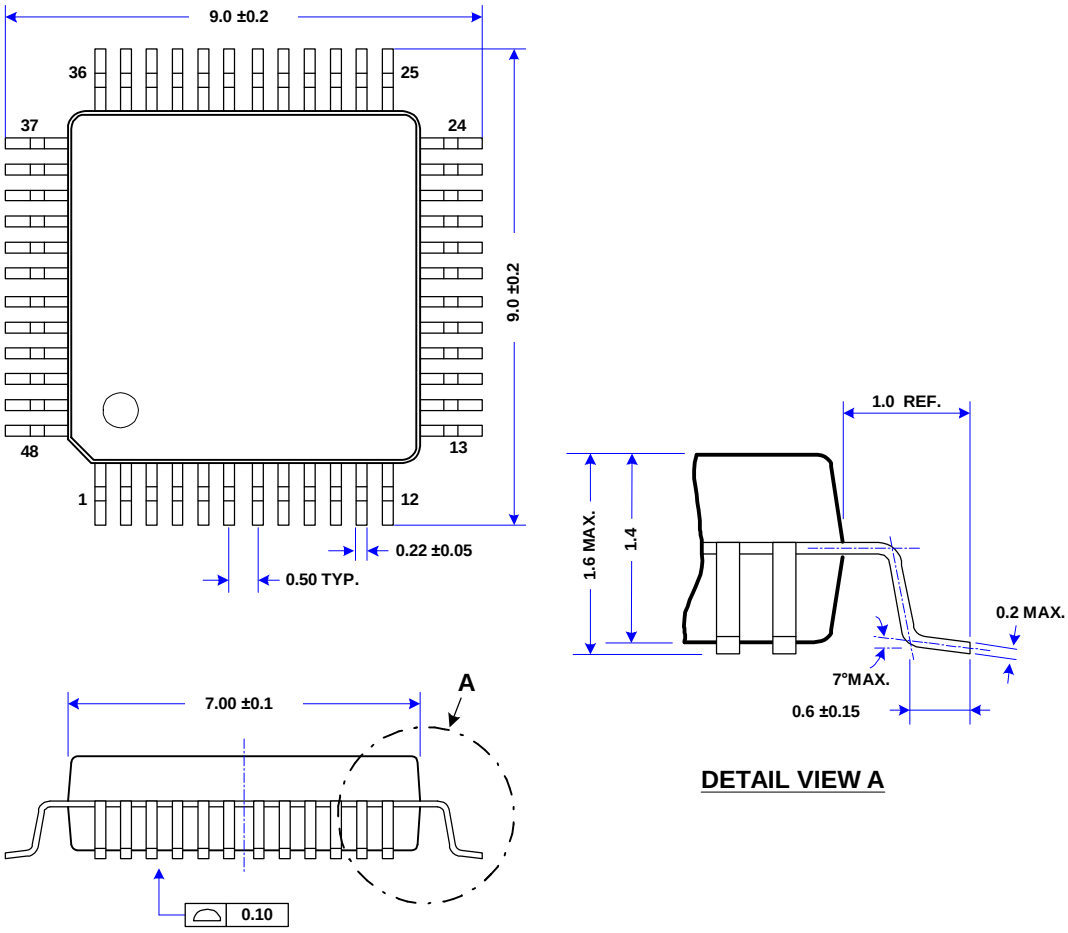
Alternate Setting = 6	
Interface 0	09 04 00 06 03 **ff ff ff** 00
Endpoint 1	07 05 81 01 20 03 01
Endpoint 2	07 05 82 02 40 00 00
Endpoint 3	07 05 83 03 01 00 **64**
Alternate Setting = 7	
Interface 0	09 04 00 07 03 **ff ff ff** 00
Endpoint 1	07 05 81 01 84 03 01
Endpoint 2	07 05 82 02 40 00 00
Endpoint 3	07 05 83 03 01 00 **64**
Alternate Setting = 8	
Interface 0	09 04 00 08 03 **ff ff ff** 00
Endpoint 1	07 05 81 01 ff 03 01
Endpoint 2	07 05 82 02 40 00 00
Endpoint 3	07 05 83 03 01 00 **64**

6. Application Circuit



7. Package Dimension

l 48pin LQFP



(All dimensions are in Millimeters)