
PAC7332 VGA PC Camera Single-Chip with Audio

General Description

The PAC7332 is a single chip with an embedded VGA CMOS image sensor and USB 1.1 interface. It has JPEG image compression and image processing. The generic application is a PC camera. And the optical size is 1/6" which can easily be embedded in LCD monitors, notebooks or PDA. It also provides high quality audio sampling function for sound recording. It is fully compliant with USB Video Class 1.0 and USB Audio Class 1.0 standard.

PAC7332 supports the interface to a serial-EEPROM. When the EEPROM function is enabled, the internal control registers can be power-up loaded from external EEPROM. This allows customization of VID, PID, product string...etc.

Features

- USB Features
 - USB video class 1.0 compliance.
 - USB audio class 1.0 compliance.
- Micro Controller Features
 - Built-in 8 bit micro controller with mask ROM and SRAM. Firmware supports AE, AWB, and USB protocol.
 - Programmable codes uploaded from serial EEPROM/Flash(SPI).
- Audio Controller Features
 - USB audio class 1.0 compliance.
 - Built in 10 bit mono audio ADC for audio recording through microphone.
 - Sampling rate @48kHz, resolution 16 bits format
- Miscellaneous Features
 - USB Vendor ID, Product ID, device release number, maximum power consumption and the string descriptor index and data selectable via a serial EEPROM or by metal mask.
 - Support MJPG and YUV.
 - USB 5V power in, on-chip 3.3V regulator for IO PAD and PHY.
 - 36-pin CSP

Key Specification

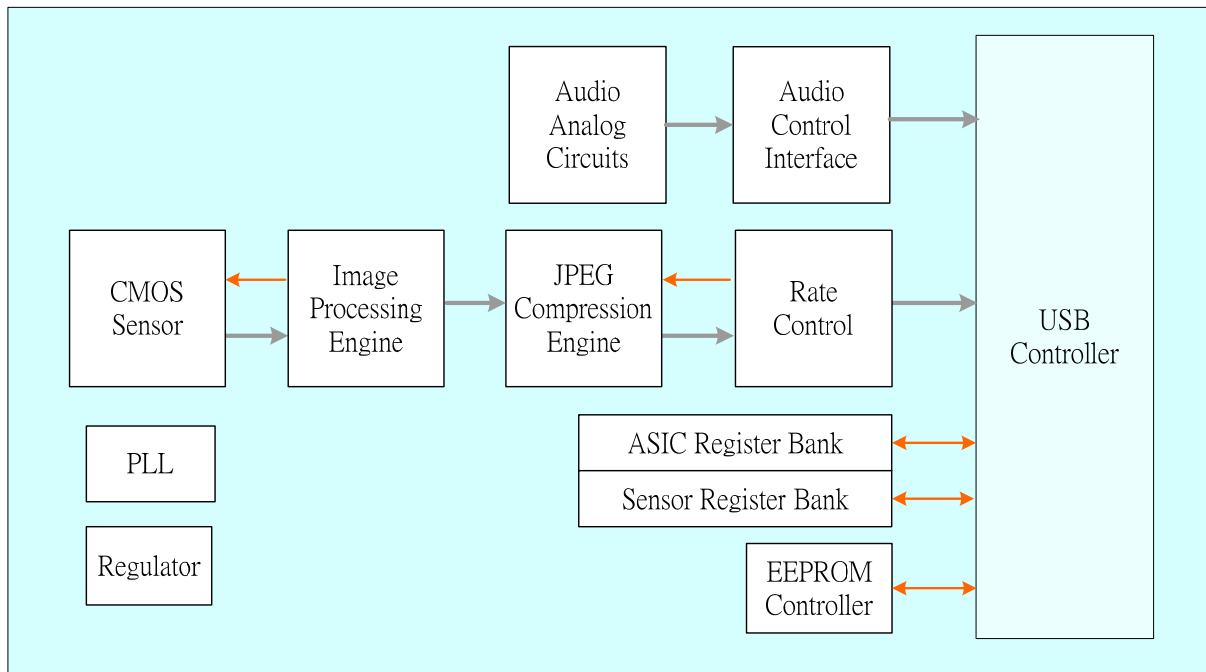
Supply Voltage	5.0V
Resolution	640 (H) x 480 (V)
Optical format	1/6"
Pixel Size	3.6um x 3.6um
Frame Rate	Up to 30fps
System Clock	12MHz
Color Filter	RGB Bayer Pattern
Scan mode	Progressive
Package	36-pin CSP

1. Pin Assignment

1.1 36P CSP Package

Pin#	Name	Type	Description
1	LED	OUT	LED driver
2	Reg_SDA	I/O	I2C data for test
3	Reg_SCL	IN	I2C clock for test
4	GPIO[2]	I/O	General purpose I/O
5	GPIO[4]	I/O	General purpose I/O
6	VSSD	GND	Ground for digital
7	VDDMD5V	PWR	5V power for digit circuit
8	VDD18K	BYPASS	Logic power for digit circuit, 1.8V
9	VDDMD	BYPASS	Logic power for digit circuit, 3.3V
10	OSC_OUT	GND	Crystal output
11	OSC_IN	IN	Crystal input
12	PXOP	OUT	Not connect
13	DP	I/O	DP for USB1.1 PHY
14	DN	I/O	DN for USB1.1 PHY
15	KEY	IN	Snapshot control signal (Active Low, internal pull-up 100Kohm)
16	GPIO[1]	I/O	General purpose I/O
17	GPIO[3]	I/O	General purpose I/O
18	VDDAY	BYPASS	Logic power for sensor
19	VSSAY	GND	Analog ground
20	VDDAD	BYPASS	Logic power for analog circuit, 2.5V
21	VDDMA	BYPASS	Logic power for analog circuit, 2.5V
22	VDDMA5V	PWR	5V power for analog circuit
23	VDD36A_A	BYPASS	Analog MIC reference audio power 3.6V
24	VDD28A	BYPASS	Analog MIC reference audio power 2.8V
25	MIC_P	IN	Microphone positive input
26	MIC_N	IN	Microphone negative input
27	VCOM	BYPASS	Microphone common mode voltage reference(audio power)
28	VSSA_ADUIO	GND	Audio analog circuit GND
29	EPR_SI	OUT	Data input of EEPROM
30	EPR_CSB	OUT	Chip Select of EEPROM
31	EPR_SCK	OUT	Serial clock of EEPROM
32	EPR_SO	IN	Data out of EEPROM
33	VSSD	GND	Ground for digital
34	VDD18K	BYPASS	Logic power for digit circuit, 1.8V
35	TESTMD	IN	Test pin.
36	GPIO[0]	I/O	General purpose I/O

2. Block Diagram



PAC7332 is a USB PC Camera SOC with enhanced image quality and sensitivity, internal regulators, JPEG image compression, image processing scheme, control registers, on-chip SRAM for image data buffer and USB controller. And the JPEG compressed image data is transmitted by USB 1.1 isochronous pipe. PAC7332 supports the interface to a serial-EEPROM. When the EEPROM function is enabled, the internal control registers can be power-up loaded from external EEPROM. This allows customization of VID, PID, product string...etc.

3. Specifications

Absolute Maximum Ratings

Exceeding the Absolute Maximum Ratings shown below invalidates all AC and DC electrical specifications and may result in permanent device damage.

Symbol	Parameter	Min	Max	Unit	Notes
T _{STG}	Ambient storage temperature	-25	125	°C	
V _{DD}	DC supply voltage	-0.5	5.5	V	
V _{IN}	DC input voltage	0.5	3.8	V	
V _{OUT}	DC output voltage	-0.5	3.8	V	
ESD	ESD Rating, Human Body model		2	kV	

Recommend Operating Condition

Symbol	Parameter	Min	Typ.	Max	Unit	Notes
T _A	Temperature Range	Operation	-10	-	70	°C
		Stable Image	0	-	50	°C
V _{DD}	Power supply voltage	4.5	5.0	5.5	V	
F _{CLK}	System clock frequency	-	12.0	-	MHz	

DC Electrical Characteristics (Typical values at 25°C, V_{DD}=5.0V, F_{CLK}=12.0MHz)

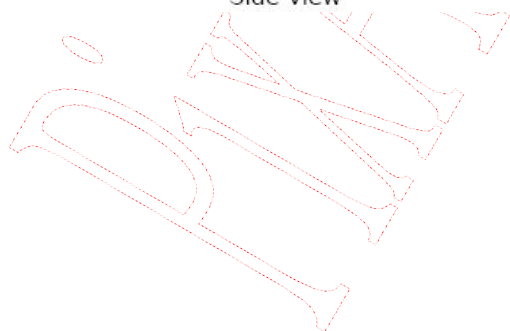
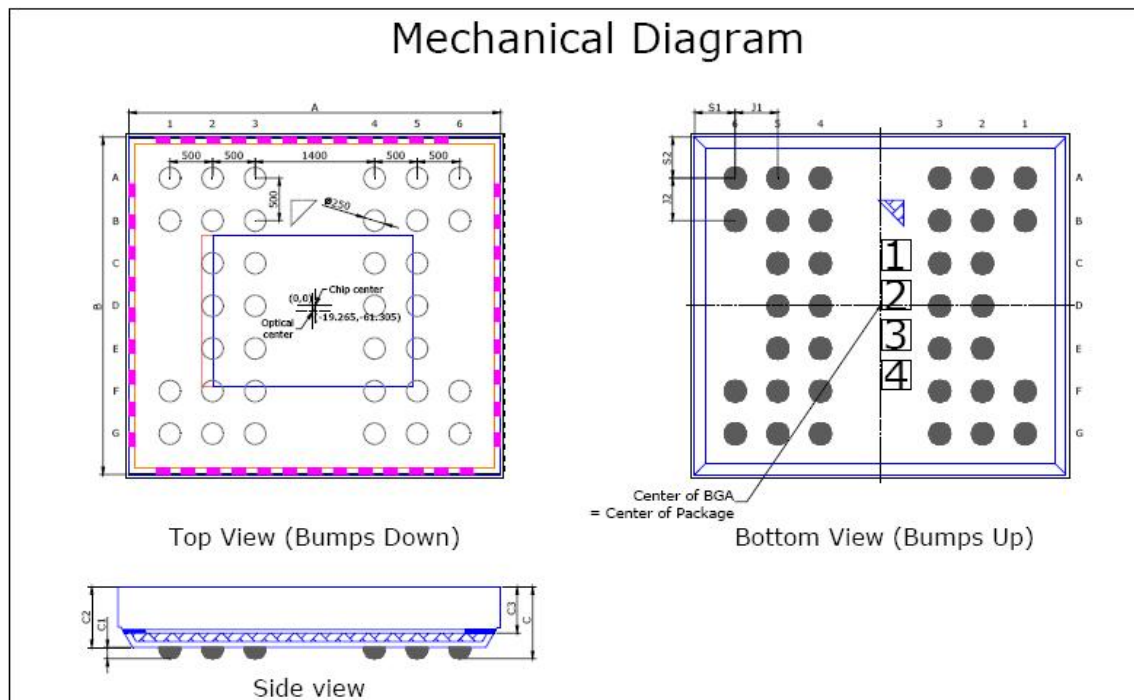
Symbol	Parameter	Min.	Typ.	Max.	Unit	Notes
Type: PWR						
I _{DD}	Operating Current	-	40	-	mA	@30 frame/sec
I _{PWDN}	Power Down current			500u		
Type: IN & I/O, Reset						
V _{IH}	Input voltage HIGH	0.7V _{DDMD}	-		V	
V _{IL}	Input voltage LOW		-	0.3V _{DDMD}	V	
Type: OUT & I/O						
V _{OH}	Output voltage HIGH	0.9V _{DDMD}	-	-	V	
V _{OL}	Output voltage LOW	-	-	0.1V _{DDMD}	V	

4. Package Information

4.1 CSP Pin Assignment and Optical Center Information

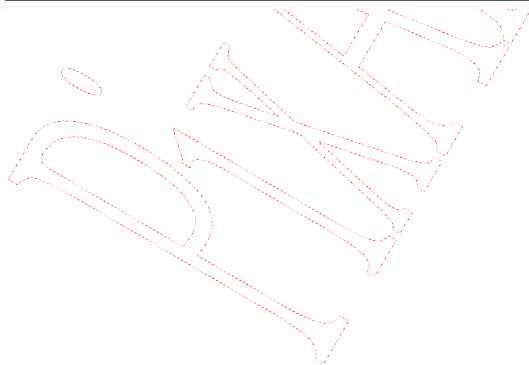
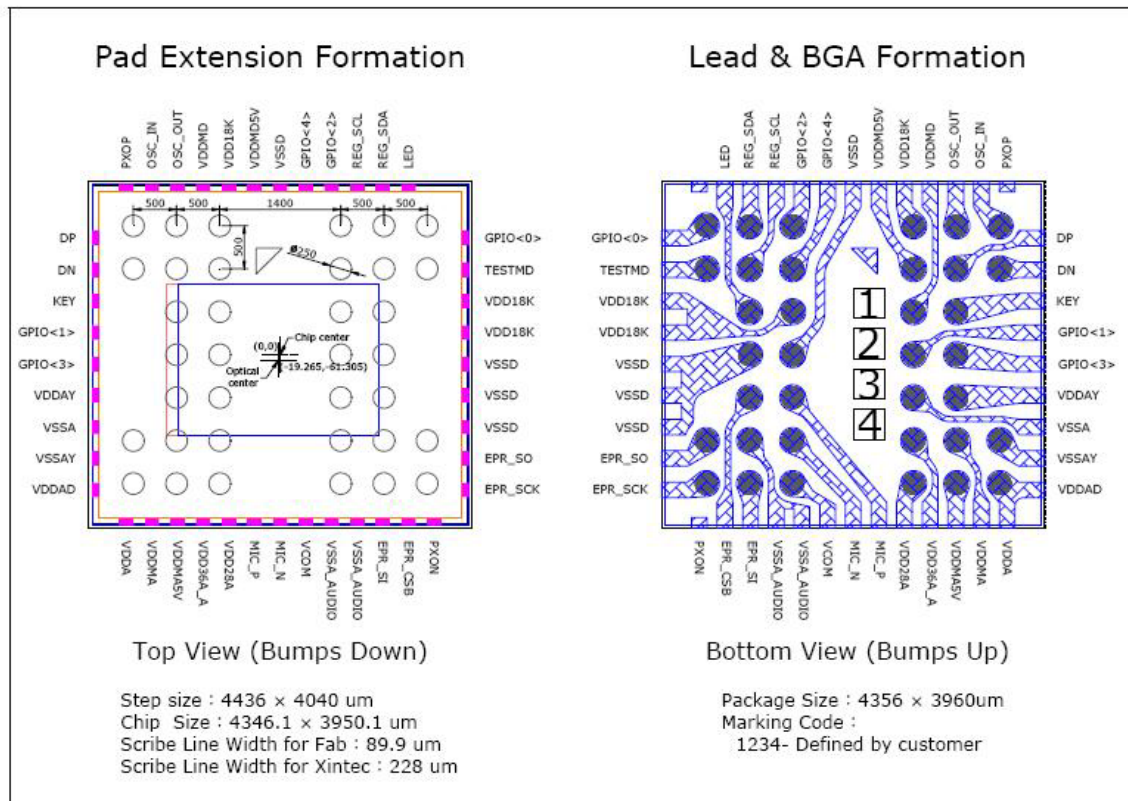
	Symbol	Nominal	Min.	Max.
			μm	
Package Body Dimension X	A	4356	4331	4381
Package Body Dimension Y	B	3960	3935	3985
Package Height	C	850	790	910
Ball Height	C1	130	100	160
Package Body Thickness	C2	720	675	765
Thickness of Glass surface to wafer	C3	545	525	565
Ball Diameter	D	250	220	280
Total Pin Count	N	36		
Pin Count X axis	N1	6		
Pin Count Y axis	N2	7		
Pins Pitch X axis	J1	500/1400		
Pins Pitch Y axis	J2	500		
Edge to Pin Center Distance along X	S1	478	448	508
Edge to Pin Center Distance along Y	S2	480	450	510

- ※ Thickness of Bond1 glass is 500 um (1pcs) !
- ※ The material of solder ball is "Sn 96.5% / Ag 3% / Cu 0.5%"

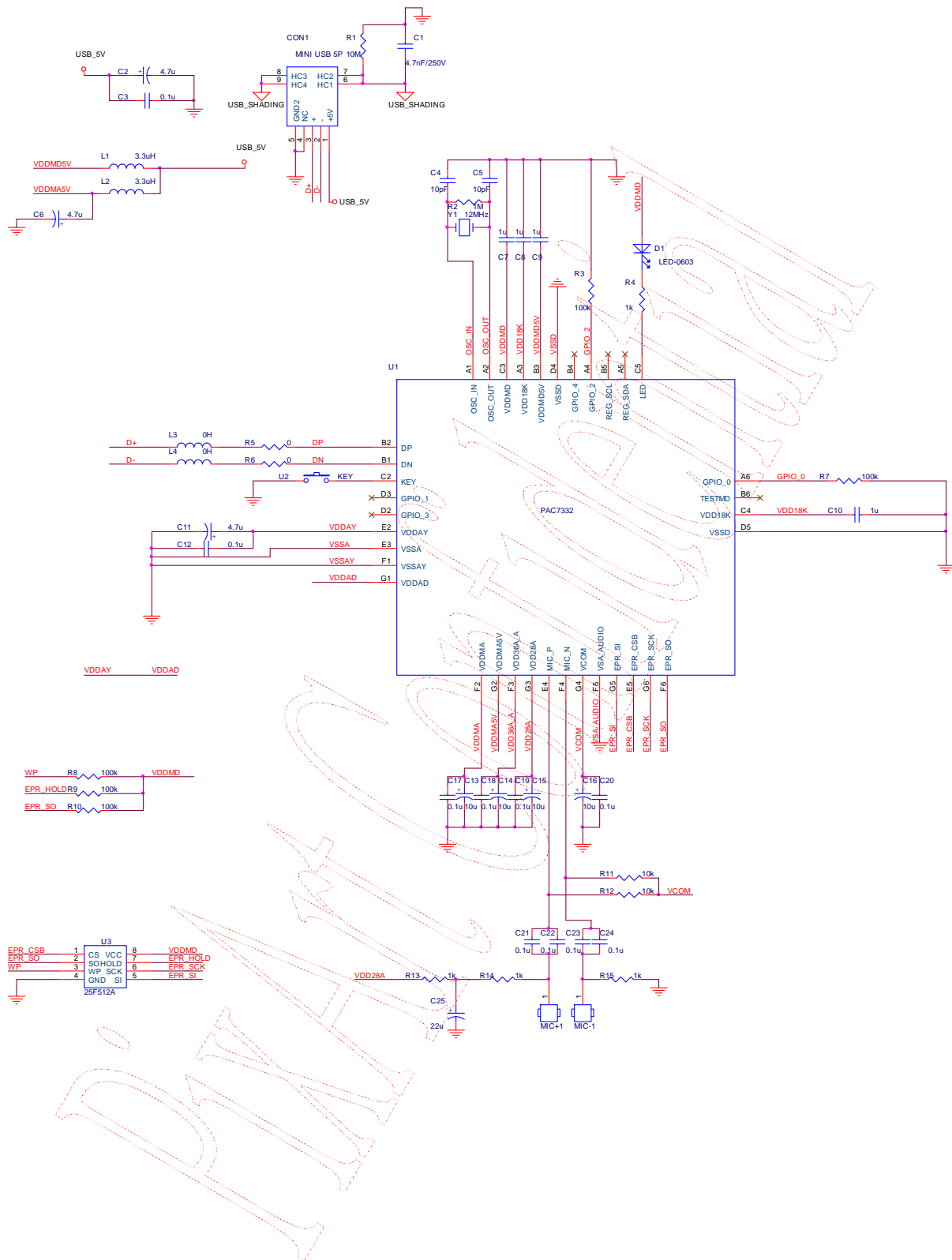


4.1 CSP Package Ball Matrix Table

	1	2	3	4	5	6
A	OSC_IN	OSC_OUT	VDD18K	GPIO<2>	REG_SDA	GPIO<0>
B	DN	DP	VDDMD5V	GPIO<4>	REG_SCL	TESTMD
C		KEY	VDDMD	VDD18K VDD18K	LED	
D		GPIO<3>	GPIO<1>	VSSD	VSSD / VSSD / VSSD	
E		VDDAY	VSSA	MIC_P	EPR_CSB	
F	VSSAY	VDDMA	VDD36A_A	MIC_N	VSSA_AUDIO VSSA_AUDIO	EPR_SO
G	VDDAD VDDA	VDDMA5V	VDD28A	VCOM	EPR_SI	EPR_SCK



5. Reference Application Circuit



Update History

Version	Update	Date
V1.0	Creation, Preliminary 1 st version	07/16/2009

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