

MS9282

Analog VGA/YPBPR to HDMI

Converter

Datasheet

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General Description

The MS9282 is a single chip for analog VGA/YPbPr to HDMI, which integrated with 10-bit triple-ADC of video and advanced HDMI 1.3 transmitter. It can support high performance conversion of YPbPr or VGA to HDMI, which can be used to connect legacy analog consumer electronics devices with the latest digital HDMI HD TVs and monitors. The resolution of video input can support up to 1080P@60Hz, and it can also support high quality audio by I2S and SPDIF. The MS9282 includes an additional I2C master port to control the DDC bus for reducing system cost.

Features

Analog Video Input

- ◆ 10-bit triple-ADC
- ◆ Maximum analog sampling rate up to 165MSPS
- ◆ Supports analog input range: 0.45V ~ 1.1V (P-P)
- ◆ Two analog input channels
- ◆ 2 to 1 input multiplexer
- ◆ Supports RGBHV/RGBS/YCbCr/YPbPr inputs
- ◆ Auto offset/phase adjustment
- ◆ Supports Sync-on-Green(SOG) and Composite-sync
- ◆ Supports input resolution up to 1080P
- ◆ Supports macro-vision input

Auto-mode Detection

Auto Position (Blank) Detection

Digital Audio Input

- ◆ SPDIF input supports 2-channel PCM or Compressed Dolby Digital, DTS digital audio Transmission
- ◆ Supports I2S at 32K/44.1K/48K/88.2K/96K/192K sample rate

Video Process

- ◆ Programmable data enable generation
- ◆ Built in RGB to YCbCr and YCbCr to RGB color space conversion
- ◆ Brightness, saturation and contrast adjustable

HDMI Output

- ◆ Supports HDMI 1.3 and DVI1.0
- ◆ Integrated HDMI 1.3 TMDS core running at 165MHz
- ◆ Supports 24-bit color depth and resolutions up to 1080P@60Hz
- ◆ Supports CEC and Hot Plug
- ◆ Supports HDCP via external EPROM

System Control

- ◆ Slave I2C interface
- ◆ I2C master interface for DDC control
- ◆ Supports external crystal from 10MHz to 30MHz
- ◆ Flexible interrupt registers with interrupt pin

Package

- ◆ LQFP-64 plastic(10mm×10mm)
- ◆ PB-free and RoHS compliant

Applications

- ◆ VGA to HDMI Adapter/Docking Station
- ◆ Handheld/Portable Device
- ◆ PC/NB Periphery

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Function Block Diagram

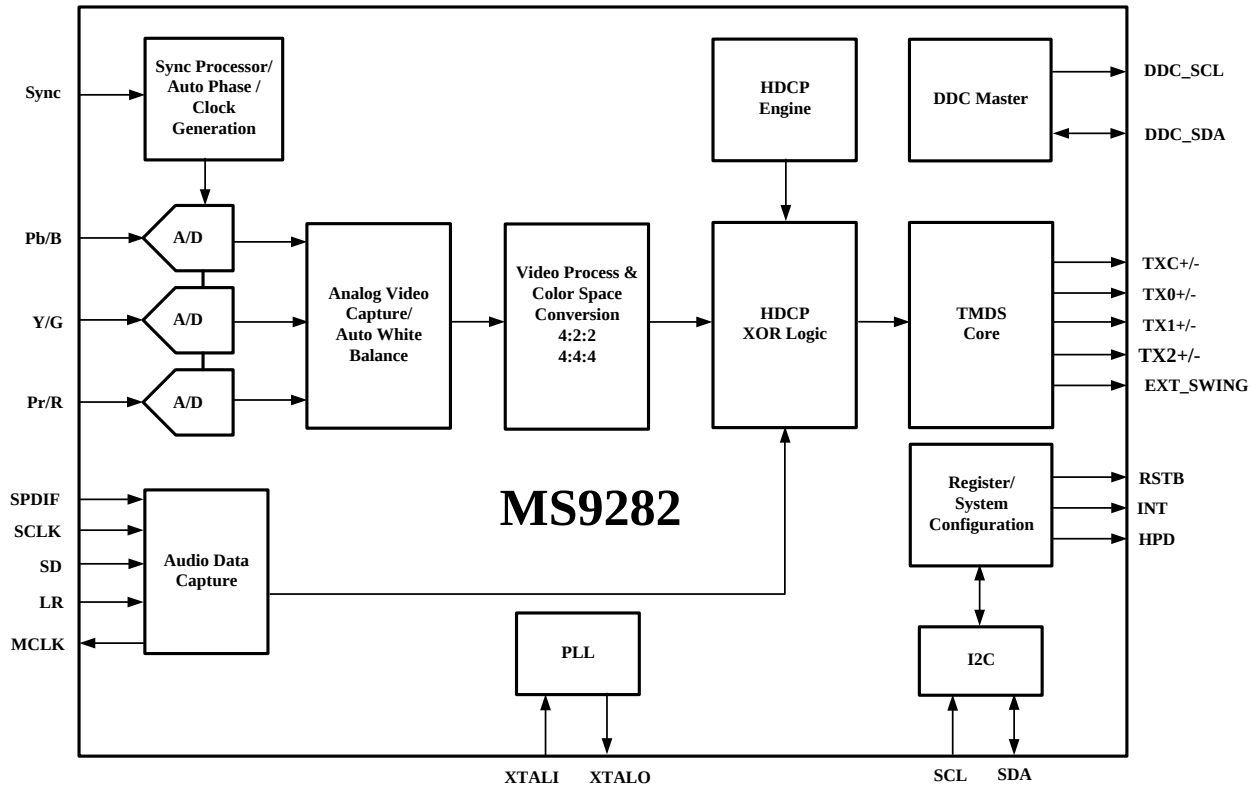


Figure 1. Function Block

PIN Map

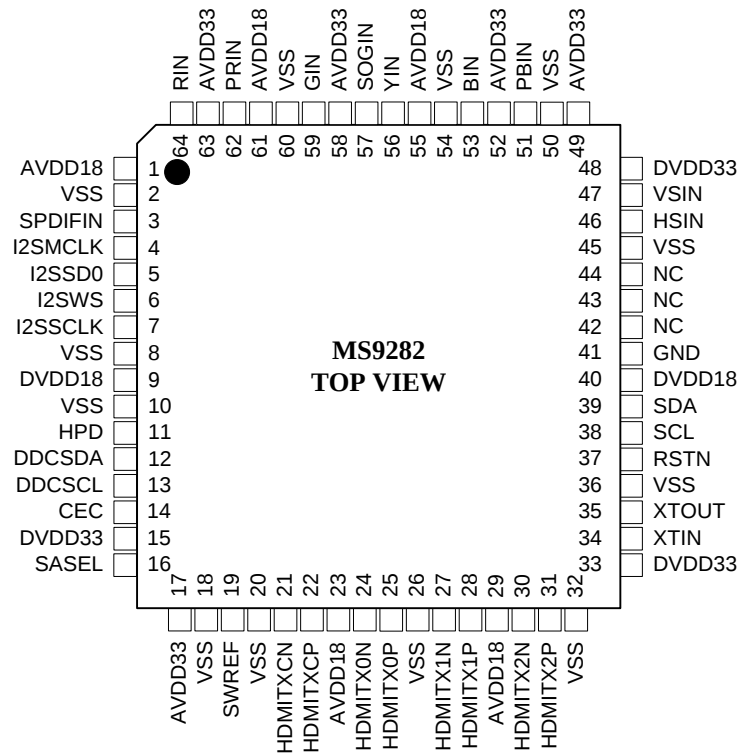


Figure 2. Pin Map

PIN Description

Table 1. PIN Description

Pin Name	Pin #	Type	Description
System			
RSTN	37	DI	External reset in, active low
XTIN	34	AI	External crystal input
XTOUT	35	AO	External crystal output
SCL	38	DI	Serial bus clock of slave device
SDA	39	DIO	Serial bus data of slave device
SASEL	16	DI	Serial address selection
HPD	11	AI	Hot plug detection
CEC	14	DIO	CEC link to sink device
DDCSCL	13	DO	Serial bus clock of master device
DDCSDA	12	DIO	Serial bus data of master device
Analog Video Input			
PRIN	62	AI	1st set analog video PR component in
YIN	56	AI	1st set analog video Y component in
PBIN	51	AI	1st set analog video PB component in
RIN	64	AI	2nd set analog video R component in
GIN	59	AI	2nd set analog video G component in
BIN	53	AI	2nd set analog video B component in
SOGIN	57	AI	Analog video composite SYNC in
HSIN	46	DI	Horizontal SYNC input
VSIN	47	DI	Vertical SYNC input
Audio Interface			
I2SSCK	7	DI	I2S audio data clock
I2SWS	6	DI	I2S audio L/R channel index
I2SSD0	5	DI	I2S audio data
I2SMCLK	4	DO	Audio master clock
SPDIFIN	3	AI	SPDIF audio input
HDMI TX Interface			
HDMITXCN	21	AO	TMDS output clock
HDMITXCP	22	AO	
HDMITX0N	24	AO	TMDS output data channel 0
HDMITX0P	25	AO	
HDMITX1N	27	AO	TMDS output data channel 1
HDMITX1P	28	AO	
HDMITX2N	30	AO	TMDS output data channel 2

Pin Name	Pin #	Type	Description
HDMITX2P	31	AO	
SWREF	19	AO	Voltage swing adjustment A resistor connected to this pin to control the TMDS swing amplitude (normally use 1K Ω with +/-10%)
Power and Ground			
DVDD33	15,33,48	P	Digital power 3.3V
DVDD18	9,40	P	Digital power 1.8V
AVDD18	1,23,29,55,61	P	Analog power 1.8V
AVDD33	17,49,52,58,63	P	Analog power 3.3V
VSS	2,8,10,18,20,26,32,36,42,45,50,54,60	G	Digital ground
NC	42,43,44	NC	No connect

Table 2. Abbreviation of Pin Description

Abbreviation	Description
AI	Analog input
AO	Analog output
AIO	Analog bi-direction
DI	Digital input
DO	Digital output
DIO	Digital bi-direction
P	Power
G	Ground
NC	No connect

Electrical Characteristics

Absolute Maximum Ratings

Table 3. Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Ambient Operating Temperature	TA	0 to 70	°C
Storage Temperature	Tsto	-40 to 150	°C
ESD Ratings	Vsed		
Human Body Model		2000	V
Machine Model		200	V

Note1: Stresses above those listed in Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only and does not imply functional operation of the device. Exposure to Absolute Maximum Ratings for extended periods may affect device reliability.

ESD CAUTION: Electrostatic charges accumulate on the human body and test equipment and can discharge without detection. Although this product features has dedicated ESD protection circuitry, permanent damage may occur on devices subjected to high energy electrostatic discharges. Therefore, proper ESD precautions are recommended to avoid performance degradation or loss of functionality.

DC Characteristics

Table 4. DC Characteristics

Parameter	Symbol	MIN	TYP	MAX	Unit
Analog Module 3.3V Power	AVDD33	2.97	3.3	3.63	V
Analog Module 1.8V Power	AVDD18	1.62	1.8	1.98	V
Digital 3.3V Power	DVDD33	2.97	3.3	3.63	V
Digital 1.8V Power	DVDD18	1.62	1.8	1.98	V
Analog Module 3.3V Current	I _{AVDD33}		45		mA
Analog Module 1.8V Current	I _{AVDD18}		165		mA
Digital 3.3V Current	I _{DVDD33}		5		mA
Digital 1.8V Current	I _{DVDD18}		60		mA

Video ADC Characteristics

Table 5. Video ADC Characteristics

Symbol	MIN	TYP	MAX	Unit
Voltage Reference				
Reference Voltage	--	1.22	--	V
Input Signal Voltage	0.5	--	1	V
Static Performance				
ADC Resolution	--	10	--	Bit
DNL (Differential Non-Linearity)	--	+/-0.5	--	LSB
INL (Integral Non-Linearity)	--	+/-1	--	LSB
Dynamic Performance				
Sample Rate	13.5	--	165	MHz
SNDR	--	56	--	dB
SFDR	--	70	--	dB
Power Supply				
Supply Voltage for AVDD33	2.97	3.3	3.63	V
Supply Voltage for AVDD18	1.62	1.8	1.98	V

Audio I2S Input Interface

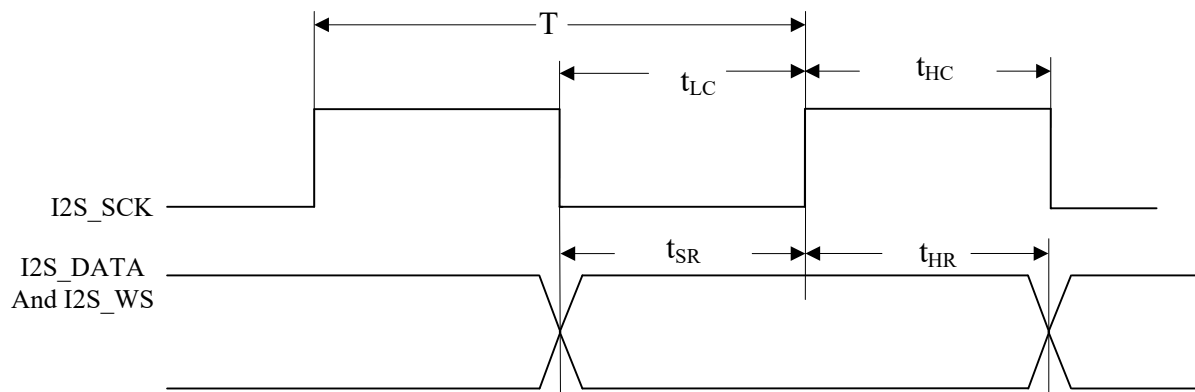


Figure 3. I2S Input Interface

Table 6. Parameter of I2S Input Interface

Symbol	MIN	MAX	Unit
Clock Period (T)	--	12.288	MHz
High-voltage Time (t_{HC})	0.35	0.65	T
Low-voltage Time (t_{LC})	0.35	0.65	T
Set-up Time (t_{SR})	0.20	--	T
Hold Time (t_{HR})	0.00	--	T

Audio SPDIF Input Interface

Table 7. Parameter of Audio SPDIF Input Interface

Symbol	MIN	TYP	MAX	Unit
Data Rate	--	12.288	--	Mbps
Input Range	0.5	1	--	V

HDMI 1.3 TMDS Core

Table 8. Parameter of HDMI 1.3 TMDS Core

Symbol	Parameter	Pin Type	Conditions	Min	Typ	Max	Unit
V_{OD}	Differential Outputs Single Ended Swing Amplitude	TMDS	Rext swg = 1K Ω +/- 1%	400	500	600	mV
V_{DOH}	Differential High Level Output Voltage	TMDS		--	3.3	--	V
I_{DOS}	Differential Output Short Circuit Current	TMDS	VOUT=0V	--	--	6	pA

Package Outline

LQFP64 OUTLINE DIMENSIONS

Dimensions Shown in millimeters

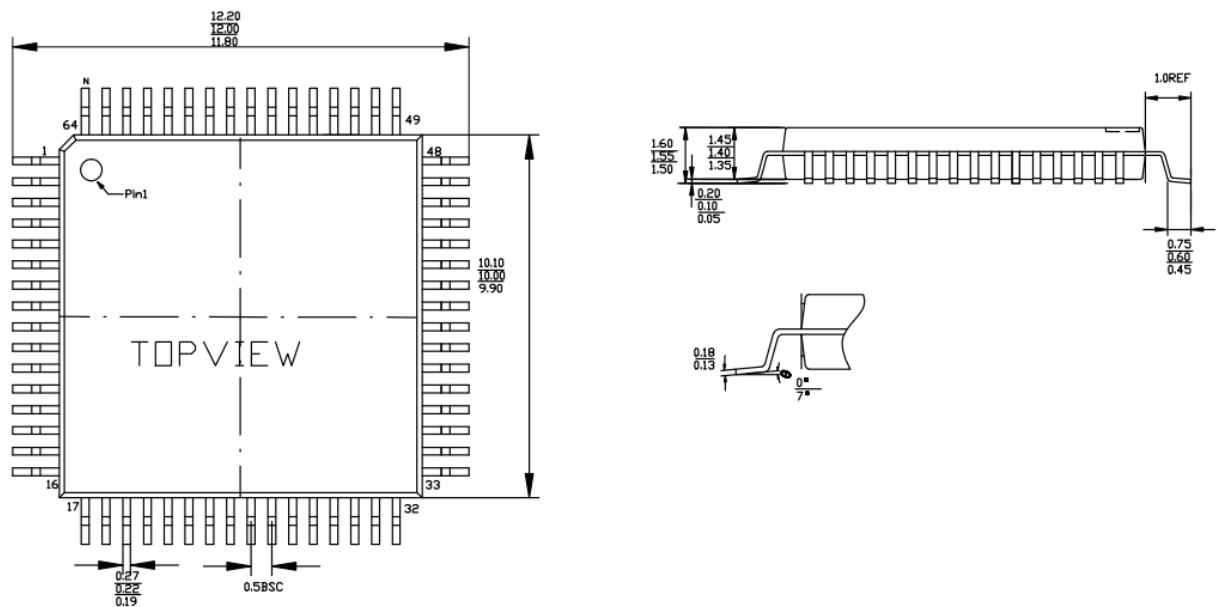


Figure 4. LQFP64 Package Diagram

Top Mark

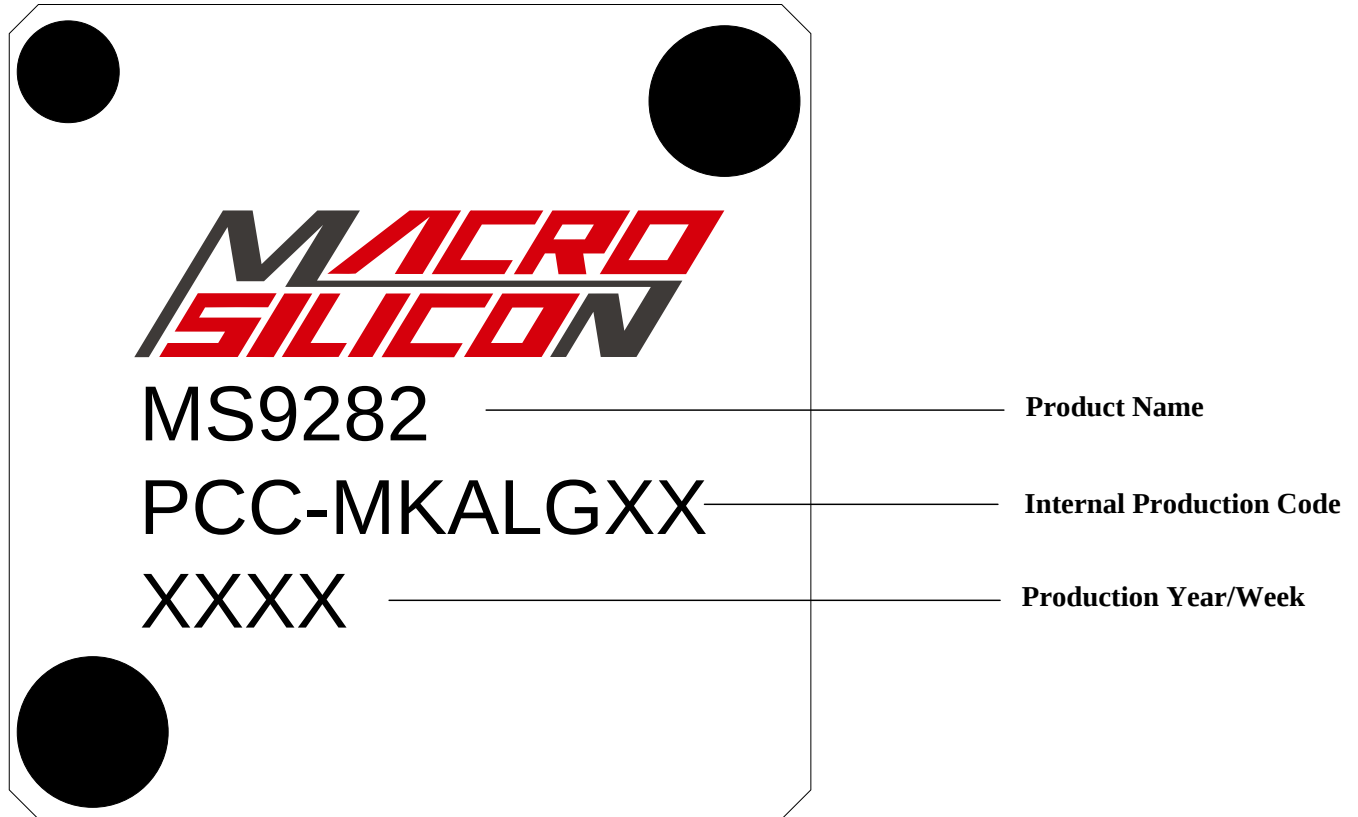


Figure 5. MS9282 Top Mark Diagram



Revision History

Date	Version	Author	Comments
2013-9-24	V1.0	John Liu	Initial Version
2016-4-20	V1.1	Feng Gu	Add Absolute Maximum Ratings
2019-9-11	V1.2	Aiguo Ding	Update pin42,43,44 name Update datasheet format