CMOS Digital Integrated Circuit Silicon Monolithic
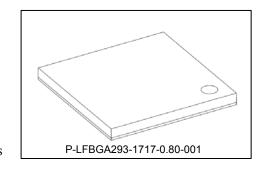
TC90195XBG

Video signal Processing

Overview

TC90195XBG is a video signal processing LSI for the HD input and output.

This device receives an analog video signal (CVBS) or a digital video signal (LVTTL/LVDS), executes the video signal processing (scaling function, image synthesis, and picture improvement feature), and outputs a digital signal (LVTTL/LVDS).

P-LFBGA293-1717-0.80-001

Application

This device is used for the equipment implementing a panel which displays a multiple image systems including a car navigation system, a display audio system, and other display equipment.

Features

- Analog video signal (CVBS) input
  - 1 channel of 10-bit ADC: 2 inputs
  - Pre-filter (LPF)
  - 2D comb filter for Y and C separation
  - Multi-color system decoder
- Digital video signal input
  - LVTTL: 1 channel
    Maximum 85 MHz. YUV = 4:2:2 or RGB = 4:4:4
  - LVDS (Single 2channels or Dual 1channel)
    Maximum 100 MHz. YUV = 4:4:4/4:2:2 or RGB = 4:4:4
- Scaling function
  - Up- scaling and down-scaling
  - Horizontal aberration correction
  - Trapezoidal correction
  - Non-linear extension
- Built-in frame memory
  - Overlay processing (an externally superimposed signal input, Chroma key processing, and rectangle region setting by a register)
  - Frame rate conversion
  - 3D-IP conversion (simple field superimposition)
- YUV picture improvement feature
  - Edge correction (HVD enhancer, sharpness, and CTI)
  - Static and dynamic YC-gamma correction
  - Color management
  - TINT adjustment
  - Contrast and brightness adjustment
  - Color gain and color offset adjustment
- RGB adjustment feature
  - Offset and gain adjustment
  - Gamma correction
  - Dither processing
- OSD superimposition
  - Font OSD display
  - Line drawing
- Digital signal output format
  - LVTTL: 1 channel
    Maximum 54 MHz. YUV = 4:2:2 or RGB = 4:4:4
    T-con pulse output (at RGB 18-bit output)
  - LVDS (Single 2 channels or Dual 1 channel)
    Maximum 100 MHz. YUV = 4:4:4/4:2:2 or RGB = 4:4:4
- PWM output (2 pins)
- Built-in PLL (built-in SSCG function)
- I^2C BUS control
- Operating temperature: -40 ℃ to 85 ℃
- Power supply voltage: 1.2 V and 3.3 V
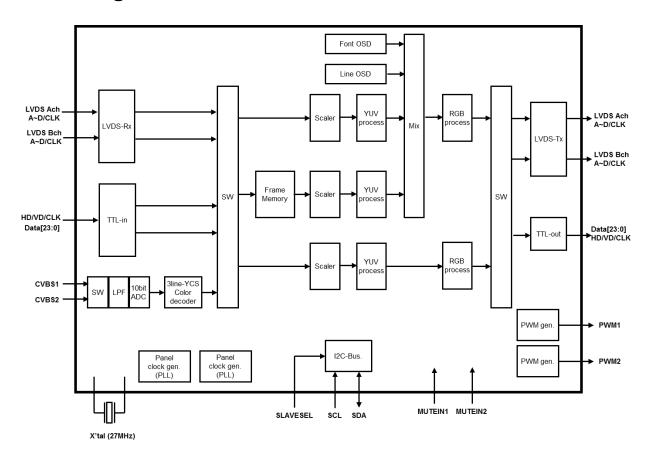
Rev. 1.00
2017-04-03

1. Block Diagram

Figure 1.1   Block diagram

2. Electrical Characteristics

2.1. Absolute Maximum Ratings

The absolute maximum ratings are the rated values which must not be exceeded during operation, even for an instant. Exceeding the maximum rating may result in destruction, degradation or other damages of the device.

Table 2.1   Absolute maximum ratings

Parameter	Symbol	Min	Typ.	Max	Unit
Core power supply (1.2 V)	VDD12	-0.3	—	VSS + 1.8	V
Standard I/O power supply (3.3 V)	VDD33	-0.3	—	VSS + 3.9	V
ADC power supply (1.2 V)	AVDD12	-0.3	—	VSS + 1.8	V
ADC power supply (3.3 V)	AVDD33	-0.3	—	VSS + 3.9	V
LVDS-Rx power supply (1.2 V)	RVDD12	-0.3	—	VSS + 1.8	V
LVDS-Rx power supply (3.3 V)	RVDD33	-0.3	—	VSS + 3.9	V
LVDS-Tx power supply (1.2 V)	TVDD12	-0.3	—	VSS + 1.8	V
LVDS-Tx power supply (3.3 V)	TVDD33	-0.3	—	VSS + 3.9	V
X'tal power supply (3.3 V)	XVDD33	-0.3	—	VSS + 3.9	V
PLL power supply (1.2 V)	PVDD12	-0.3	—	VSS + 1.8	V
DC input voltage (3.3 V)	VIN33	-0.3	—	VDD33 + 0.3	V
DC output voltage (3.3 V)	VOUT33	-0.3	—	VDD33 + 0.3	V
DC input current	IIN	—	—	±10	mA
Operating ambient temperature	Ta	-40	—	85	°C
Storage temperature	Tstg	-40	—	125	°C

2.2. Operating Conditions

Table 2.2   Operating conditions

Parameter	Symbol	Min	Typ.	Max	Unit
Core power supply (1.2 V)	VDD12	1.1	1.2	1.3	V
Standard I/O power supply (3.3 V)	VDD33	3.0	3.3	3.6	V
ADC power supply (1.2 V)	AVDD12	1.1	1.2	1.3	V
ADC power supply (3.3 V)	AVDD33	3.0	3.3	3.6	V
LVDS-Rx power supply (1.2 V)	RVDD12	1.1	1.2	1.3	V
LVDS-Rx power supply (3.3 V)	RVDD33	3.0	3.3	3.6	V
LVDS-Tx power supply (1.2 V)	TVDD12	1.1	1.2	1.3	V
LVDS-Tx power supply (3.3 V)	TVDD33	3.0	3.3	3.6	V
XTAL power supply (3.3 V)	XVDD33	3.0	3.3	3.6	V
PLL power supply (1.2 V)	PVDD12	1.1	1.2	1.3	V

2.3. Consumption current

Table 2.3 Consumption current

Parameter	Symbol	Min	Typ.	Max	Unit	Notes
Core power supply current (1.2V)	IDD12	—	200	400	mA	PLL1/PLL2=75MHz when 1dot-crosshatch processing (Notes.1)
Standard I/O power supply current (3.3 V)	IDD33	—	65	90	mA	at 75MHz output when 1dot-crosshatch processing (Notes.2)
ADC power supply current (1.2 V)	AIDD12	—	12	25	mA	—
ADC power supply current (3.3V)	AIDD33	—	15	25	mA	—
LVDS-Rx power supply current (1.2V)	RIDD12	—	75	90	mA	When Dual mode
LVDS-Rx power supply current (3.3V)	RIDD33	—	60	100	mA	When Dual mode
LVDS-Tx power supply current (1.2V)	TIDD12	—	10	20	mA	When Dual mode
LVDS-Tx power supply current (3.3V)	TIDD33	—	100	120	mA	When Dual mode
XTAL power supply current (3.3V)	XIDD33	—	5	10	mA	—
PLL power supply current (1.2V)	PIDD12	—	10	15	mA	—

Notes1: The consumption current of Core (IDD12) is depends on operating frequency and using circuit block at this IC.

Notes2: The consumption current of Standard IO power is depends on the load capacity at output pin. When the load capacity is large value, the consumption current of IDD33 may exceed the above described maximum value.

2.4. 3.3V system I/O

Table 2.4 DC characteristic (3.3V system I/O)

Parameter	Symbol	Min	Typ.	Max	Unit	Notes
Input voltage	VIH	VDD33 × 0.8	—	VDD33	V	I/O input terminal of 3.3V system
	VIL	DVSS	—	VDD33 × 0.2		I/O input terminal of 3.3V system
Input current	IIH	-10	—	10	µA	I/O input terminal of 3.3V system
	IIL	-10	—	10		I/O input terminal of 3.3V system
Output voltage	VOH	VDD33-0.6	—	VDD33	V	I/O output terminal of 3.3V system when load current 4mA
		VDD33-0.6	—	VDD33		I/O output terminal of 3.3V system when load current 8mA
	VOL	DVSS	—	0.4		I/O output terminal of 3.3V system when load current 4mA
		DVSS	—	0.4		I/O output terminal of 3.3V system when load current 8mA

2.5. LVDS input

Table 2.5   DC characteristic (LVDS input)

Parameter	Symbol	Min	Typ.	Max	Unit	Notes
Input voltage	VIN	0.2	—	2.4	V	—
Absolute input differential voltage	|Vid|	100	—	600	mV	—

2.6. LVDS output

Table 2.6   DC characteristic (LVDS output)

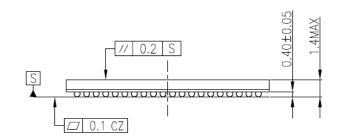| Parameter	Symbol	Min	Typ.	Max	Unit	Notes
Output voltage	VOH	—	—	1600	mV	RLOAD=100Ω±1%
	VOL	900	—	—	mV	RLOAD=100Ω±1%
Absolute differential output voltage	|VOD|	250	—	450	mV	RLOAD=100Ω±1%
Output offset voltage	VOS	1075	—	1325	mV	RLOAD=100Ω±1%

3. Package Information
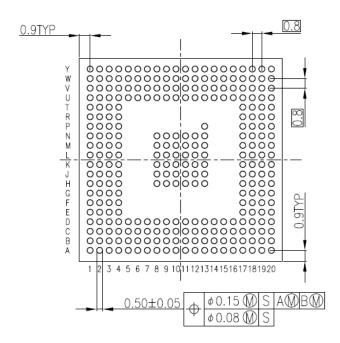
3.1. Package Diagram

P-LFBGA293-1717-0.80-001   **Unit: mm**

Weight: 0.66 g (Typical)

Figure 3.1   Package diagram

4. Revision History

Table 4.1   Revision history

Revision	Date	Description
1.00	2017/04/03	First edition

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