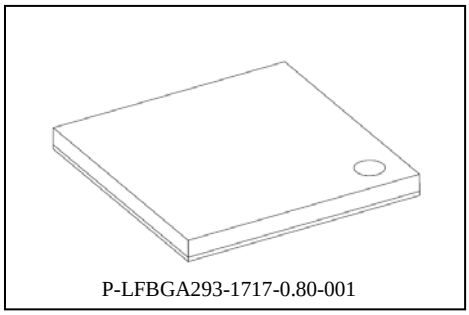
CMOS Digital Integrated Circuit Silicon Monolithic

TC90175XBG

Video signal processing IC



P-LFBGA293-1717-0.80-001

Weight 0.665g (Typ.)

Overview

TC90175XBG is a video signal LSI for the Full-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, and picture improvement feature), and outputs a digital signal (LVTTL / LVDS).

Application

This device is used for the equipument implementing a panel which displays a multiple image systems, such as a car navigation system, a display audio system, and others.

Features

- Analog video signal (CVBS) input
  - 10bit ADC 1ch, 2-in / 1-out selector switch
  - Pre-filter (LPF)
  - 3line-Y / C sepalation
  - Color decorder for multi color system
- Digital video signal input
  - LVTTL 1ch
    85MHz (max), YUV = 4:2:2 or RGB = 4:4:4
  - LVDS (Single 2ch or Dual 1ch)
    100MHz (max)@Singel-Link,
    YUV = 4:4:4/4:2:2 or RGB = 4:4:4
    (e.g. 1920x720@60fps)
    150MHz (max)@Dual-Link,
    YUV = 4:4:4/4:2:2 or RGB = 4:4:4
    (e.g. 1920x1080@60fps)
- Scaling function
  - Up / Down scaling
  - Horizontal averration correction
  - Trapezoid correction
  - Nonliner horizontal scaling
- YUV signal process
  - Edge correction (HVD-Enhancer / NC, Sharpness, CTI)
  - Static / Dynamic YC-gamma correction
  - Area-adaptive dynamic YC-gamma correction
  - Color management
  - TINT adjustment
  - Contrast adjustment, Brightness adjustment
  - Color gain adjustment, Color offset adjustment
- RGB signal process
  - Offset / Gain adustment
  - Ganmma correction
  - Dither process
- Built-in OSD function
  - Font OSD display
  - Line drawing
- Digital video signal output
  - LVTTL 1 ch
    80MHz (max), YUV = 4:2:2 or RGB = 4:4:4
    T-con signal output (Case of RGB18bit output)
  - LVDS (Single 2ch or Dual 1ch)
    100MHz (max)@Singel-Link,
    YUV = 4:4:4/4:2:2 or RGB = 4:4:4
    (e.g. 1920x720@60fps)
    150MHz (max)@Dual-Link,
    YUV = 4:4:4/4:2:2 or RGB=4:4:4
    (e.g. 1920x1080@60fps)
  - PWM signal output (2 pin)
- PLLwithin SSCGfunction
- I^2C-BUS control
- Operating temperature : -40℃to 85℃
- Power supply : 1.2 V, 3.3 V
- Package : P-LFBGA293-1717-0.80-001

1. Block Diagram

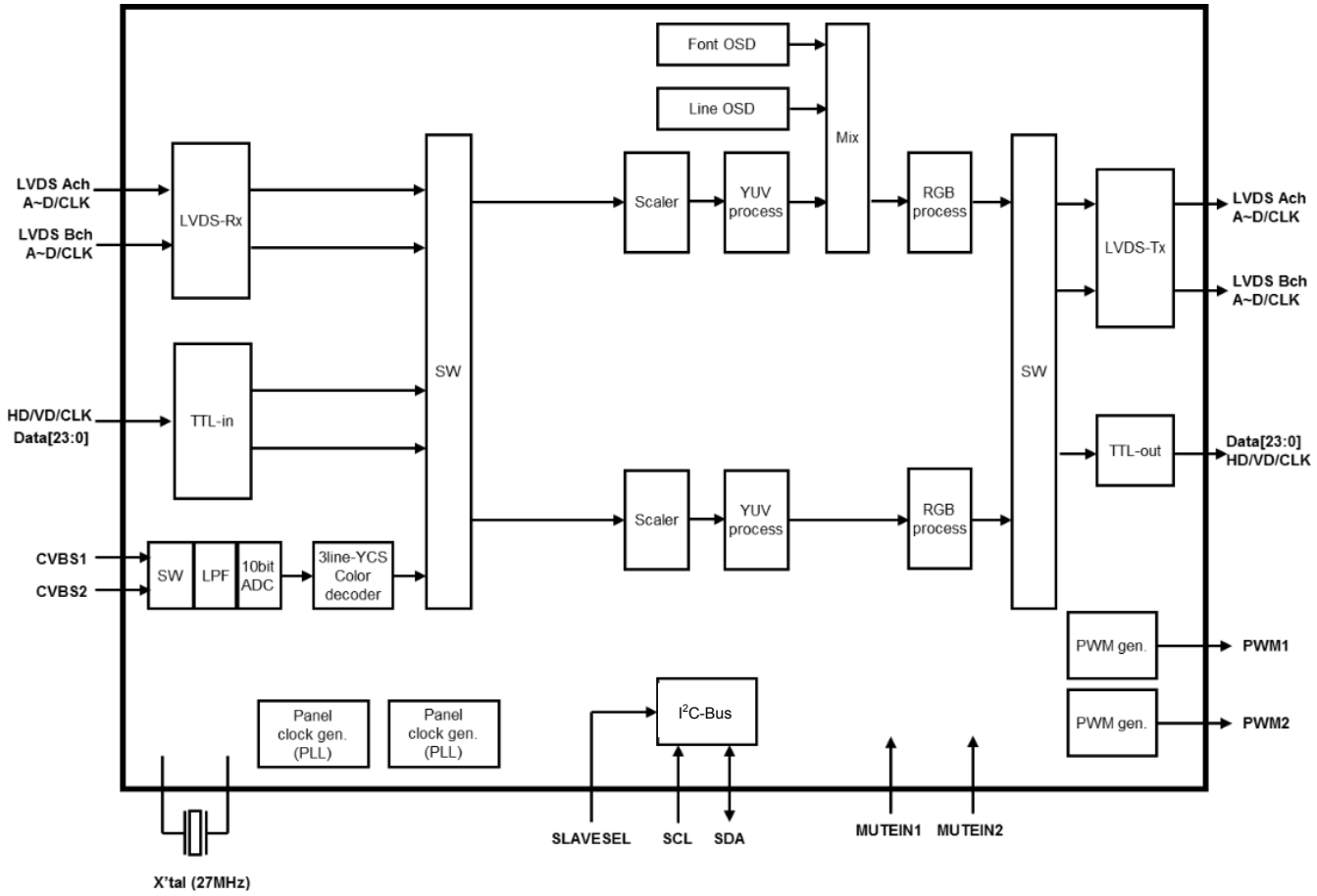


Figure 1.1 Internal Block diagram

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 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 (1.2V)	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 (3.3V)	AVDD33	3.0	3.3	3.6	V
LVDS-Rx power supply (1.2V)	RVDD12	1.1	1.2	1.3	V
LVDS-Rx power supply (3.3V)	RVDD33	3.0	3.3	3.6	V
	RVDD33 (2.5V mode)	2.3	2.5	2.7	V
LVDS-Tx power supply (1.2V)	TVDD12	1.1	1.2	1.3	V
LVDS-Tx power supply (3.3V)	TVDD33	3.0	3.3	3.6	V
	RVDD33 (2.5V mode)	2.3	2.5	2.7	V
XTAL power supply (3.3V)	XVDD33	3.0	3.3	3.6	V
PLL power supply (1.2V)	PVDD12	1.1	1.2	1.3	V

2.3. Consumption current

Table 2.3 DC characteristic (Consumption current)

Parameter	Symbol	Min	Typ.	Max	Unit	Notes
Current of Core (1.2V)	IDD12	—	210	350	mA	PLL1 = 150MHz PLL2 = 75MHz 1dot-crosshatch processing (Notes. 1)
Current of Standard I/O (3.3 V)	IDD33	—	65	90	mA	75MHz output 1dot-crosshatch processing (Notes. 2)
Current of ADC (1.2 V)	AIDD12	—	18	25	mA	-
Current of ADC (3.3V)	AIDD33	—	25	35	mA	-
Current of LVDS-Rx (1.2V)	RIDD12	—	75	90	mA	When Dual mode
Current of LVDS-Rx (3.3V)	RIDD33	—	70	110	mA	When Dual mode (3.3V mode)
		—	65	100	mA	When Dual mode (2.5V mode)
Current of LVDS-Tx (1.2V)	TIDD12	—	10	20	mA	When Dual mode
Current of LVDS-Tx (3.3V)	TIDD33	—	100	125	mA	When Dual mode (3.3V mode/350mVp-p mode)
		—	75	95	mA	When Dual mode (2.5V mode/225mVp-p mode)
Current of XTAL (3.3V)	XIDD33	—	5	10	mA	-
Current of PLL (1.2V)	PIDD12	—	10	15	mA	-

Notes. 1 : The consumption current of Core power (IDD12) is depends on operating frequency and using circuit block at this IC.

Notes. 2 : 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	VDDIO × 0.8	—	VDDIO	V	I/O input terminal of 3.3V system
	VIL	VSS	—	VDDIO × 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

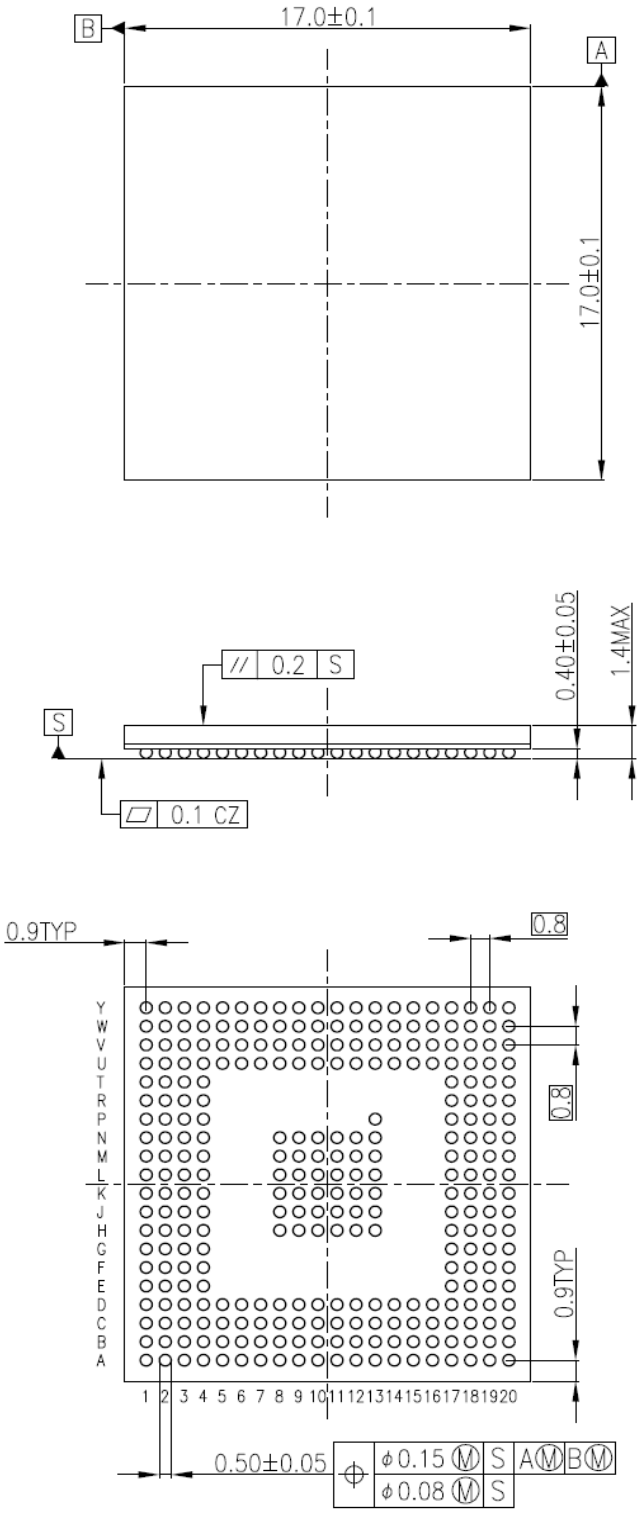
Table 2.6 DC characteristic (LVDS output)

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 : 0.665g (Typ.)

Figure 3.1 Package dimensions

4. Revision History

Table 4.1 Revision History

Revision	Date	Description
1.00	2018-07-02	First Edition

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