



# TDA9983A

HDMI transmitter up to 150 MHz pixel rate with  $3 \times 8$ -bit video inputs and  $4 \times I^2S$ -bus with S/PDIF

Rev. 01 — 13 March 2008

Product short data sheet



## 1. General description

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The TDA9983A is an HDMI transmitter (which also supports DVI) that enables a  $3 \times 8$ -bit RGB or  $YCbCr$  video stream (with a pixel rate up to 150 MHz for the TDA9983AHW/15 version), up to 4  $I^2S$ -bus audio streams (with an audio sampling rate up to 192 kHz) and the additional information required by all the HDMI 1.2a standards.

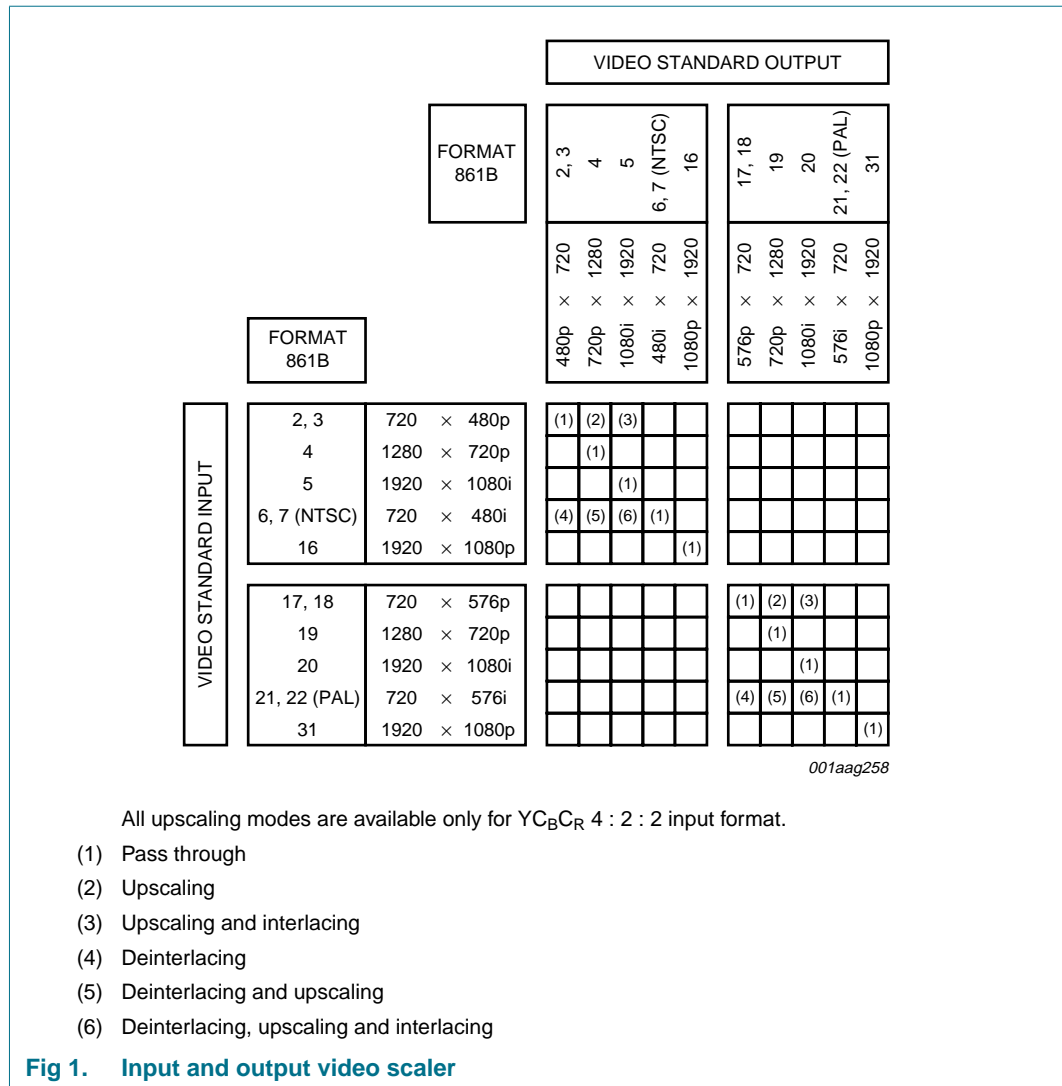
A programmable upscaling block enables a 720p/1080i output from a standard definition input. An intrafield deinterlacer is included in the scaler.

In order to be compatible with most applications, the TDA9983A integrates a full programmable input formatter and color space conversion block. The video input formats accepted are  $YCbCr$  4 : 4 : 4 (up to  $3 \times 8$ -bit),  $YCbCr$  4 : 2 : 2 semi-planar (up to  $2 \times 12$ -bit),  $YCbCr$  4 : 2 : 2 compliant with ITU656 and ITU656-like (up to  $1 \times 12$ -bit).

For ITU656-like formats, double edges are supported so that data can be sampled on rising and falling edges.

The TDA9983A also includes a HDCP 1.1 compliant cipher block. The HDCP key set is stored internally in a One Time Programming (OTP) non-volatile memory for maximum security.

The device can be controlled via an  $I^2C$ -bus interface.



## 2. Features

- 3 × 8-bit video data input bus, CMOS and LV-TTL compatible
- Horizontal synchronization, vertical synchronization and Data Enable (DE) inputs or VREF, HREF and FREF could be used for input data synchronization
- Pixel rate clock input can be made active on one or both edges (selectable by I<sup>2</sup>C-bus)
- The TDA9983A has 4 I<sup>2</sup>S-bus audio input channels and 1 S/PDIF channel; audio sampling rate up to 192 kHz
- 250 MHz to 1.50 GHz HDMI transmitter operation
- Programmable input formatter and upsampler/interpolator allows input of any of the 4 : 4 : 4, 4 : 2 : 2 semi-planar, 4 : 2 : 2 ITU656 and ITU656-like formats
- Programmable color space converter:
  - ◆ RGB to YC<sub>B</sub>C<sub>R</sub>
  - ◆ YC<sub>B</sub>C<sub>R</sub> to RGB

- The upscaler enables a 720p/1080i output from a standard definition input using intelligent edge interpolation
- Deals with multiple levels of HDCP receivers and repeaters
- Internal SHA-1 calculation
- Controllable via I<sup>2</sup>C-bus
- Low power dissipation
- 1.8 V and 3.3 V power supplies
- Power-down mode
- Hard reset

### 3. Applications

- DVD players and recorders
- Set-Top Box (STB)
- AV receivers and amplifiers (repeater)
- Camcorders
- Digital still cameras
- Media players
- PVRs
- Media centers PCs, graphics add-in boards, notebook PCs
- Switches

### 4. Quick reference data

**Table 1. Quick reference data**

$V_{DDA(FRO\_3V3)} = 3.0\text{ V to }3.6\text{ V}$ ;  $V_{DDA(PLL\_3V3)} = 3.0\text{ V to }3.6\text{ V}$ ;  $V_{DDH(3V3)} = 3.0\text{ V to }3.6\text{ V}$ ;  
 $V_{DDD(3V3)} = 3.0\text{ V to }3.6\text{ V}$ ;  $V_{DDC(1V8)} = 1.65\text{ V to }1.95\text{ V}$ ;  $V_{PP} = 0\text{ V}$ ;  $T_{amb} = 0\text{ }^{\circ}\text{C to }70\text{ }^{\circ}\text{C}$ .  
*Typical values are measured at  $V_{DDA(FRO\_3V3)} = V_{DDA(PLL\_3V3)} = V_{DDH(3V3)} = V_{DDD(3V3)} = 3.3\text{ V}$ ;  
 $V_{DDC(1V8)} = 1.8\text{ V}$ ;  $V_{PP} = 0\text{ V}$  and  $T_{amb} = 25\text{ }^{\circ}\text{C}$ ; unless otherwise specified.*

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>TDA9983AHW/8 and TDA9983AHW/15</b>						
$V_{DDA(FRO\_3V3)}$	free running oscillator 3.3 V analog supply voltage		3.0	3.3	3.6	V
$V_{DDA(PLL\_3V3)}$	PLL 3.3 V analog supply voltage		3.0	3.3	3.6	V
$V_{DDD(3V3)}$	digital supply voltage (3.3 V)		3.0	3.3	3.6	V
$V_{DDH(3V3)}$	HDMI supply voltage (3.3 V)		3.0	3.3	3.6	V
$V_{DDC(1V8)}$	core supply voltage (1.8 V)		1.65	1.8	1.95	V
$T_{amb}$	ambient temperature		0	-	70	°C
<b>TDA9983AHW/8; up to 81 MHz</b>						
$f_{clk(max)}$	maximum clock frequency	[1][2]	81	-	-	MHz
$P_{cons}$	power consumption	[1]	-	329	-	mW
		worst case [2]	-	343	512	mW
$P_{tot}$	total power dissipation	[1]	-	463	-	mW
		worst case [2]	-	477	661	mW

**Table 1. Quick reference data ...continued**

$V_{DDA(FRO\_3V3)} = 3.0\text{ V to }3.6\text{ V}$ ;  $V_{DDA(PLL\_3V3)} = 3.0\text{ V to }3.6\text{ V}$ ;  $V_{DDH(3V3)} = 3.0\text{ V to }3.6\text{ V}$ ;  
 $V_{DDD(3V3)} = 3.0\text{ V to }3.6\text{ V}$ ;  $V_{DDC(1V8)} = 1.65\text{ V to }1.95\text{ V}$ ;  $V_{PP} = 0\text{ V}$ ;  $T_{amb} = 0\text{ }^{\circ}\text{C to }70\text{ }^{\circ}\text{C}$ .  
*Typical values are measured at  $V_{DDA(FRO\_3V3)} = V_{DDA(PLL\_3V3)} = V_{DDH(3V3)} = V_{DDD(3V3)} = 3.3\text{ V}$ ;  
 $V_{DDC(1V8)} = 1.8\text{ V}$ ;  $V_{PP} = 0\text{ V}$  and  $T_{amb} = 25\text{ }^{\circ}\text{C}$ ; unless otherwise specified.*

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$P_{pd}$	power dissipation in power-down mode		-	13.5	38.4	mW

**TDA9983AHW/15; up to 150 MHz**

$f_{clk(max)}$	maximum clock frequency	[3]	150	-	-	MHz
$P_{cons}$	power consumption	[3]	-	361	583	mW
$P_{tot}$	total power dissipation	[3]	-	495	732	mW
$P_{pd}$	power dissipation in power-down mode		-	13.5	38.4	mW

- [1] Video format:
  - a) Input 480p (ITU656 embedded sync, rising edge)
  - b) Output 1080i (Y<sub>C</sub>B<sub>C</sub>R 4 : 2 : 2)
- [2] Worst case video format:
  - a) Input 480p (Y<sub>C</sub>B<sub>C</sub>R 4 : 2 : 2 semi-planar)
  - b) Output 720p (Y<sub>C</sub>B<sub>C</sub>R 4 : 2 : 2)
- [3] Video format:
  - a) Input 1080p (RGB 4 : 4 : 4 external sync, rising edge)
  - b) Output 1080p (RGB 4 : 4 : 4)

## 5. Ordering information

**Table 2. Ordering information**

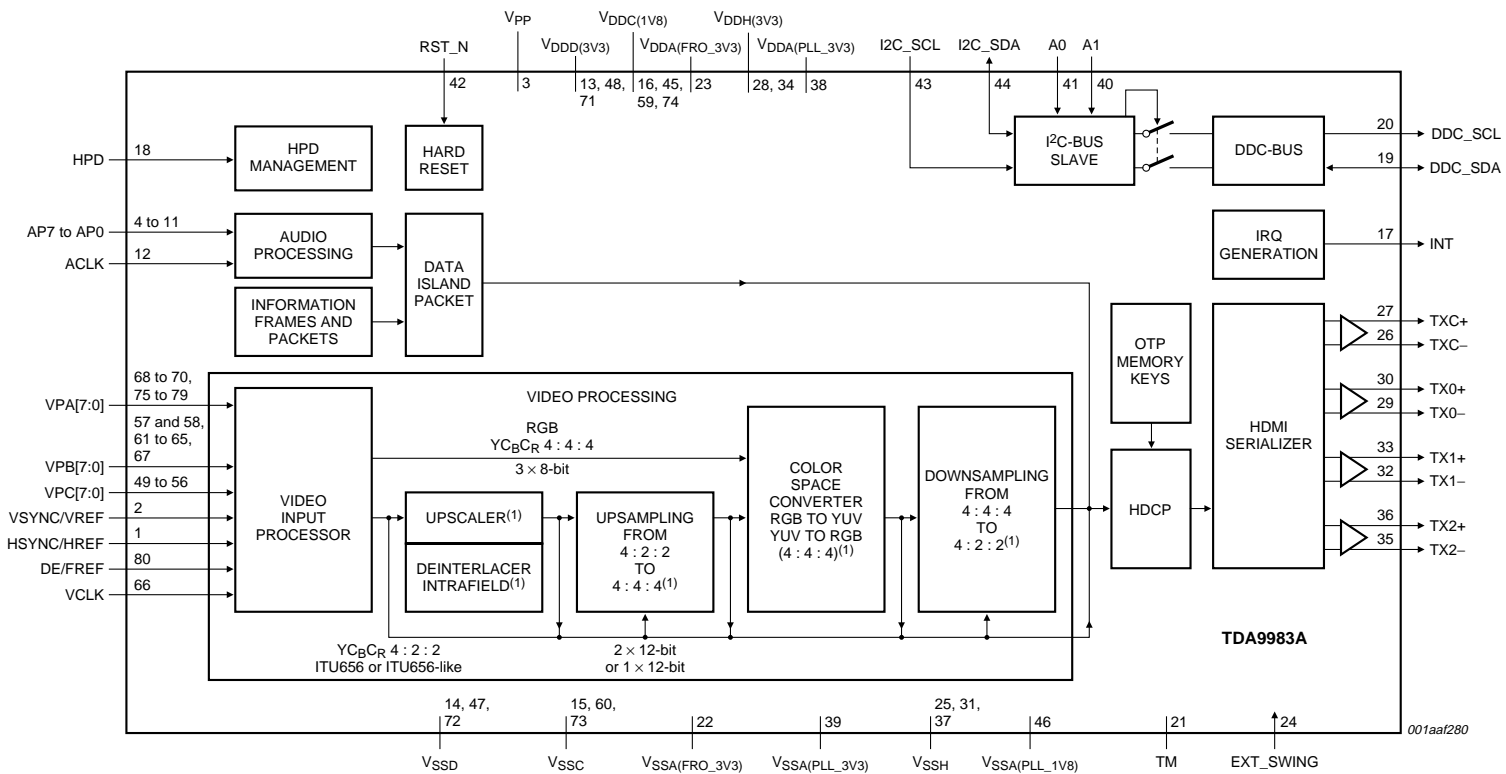
Type number	Package		
	Name	Description	Version
TDA9983AHW	HTQFP80	plastic thermal enhanced thin quad flat package; 80 leads; body 12 × 12 × 1 mm; exposed die pad	SOT841-4

### 5.1 Ordering options

**Table 3. Survey of type numbers**

Extended type number	Sampling frequency (Msample/s)	Application
TDA9983AHW/8/C1xx	81	customer specific version
TDA9983AHW/15/C1xx	150	customer specific version

## 6. Block diagram



(1) Block can be bypassed.

Fig 2. Block diagram

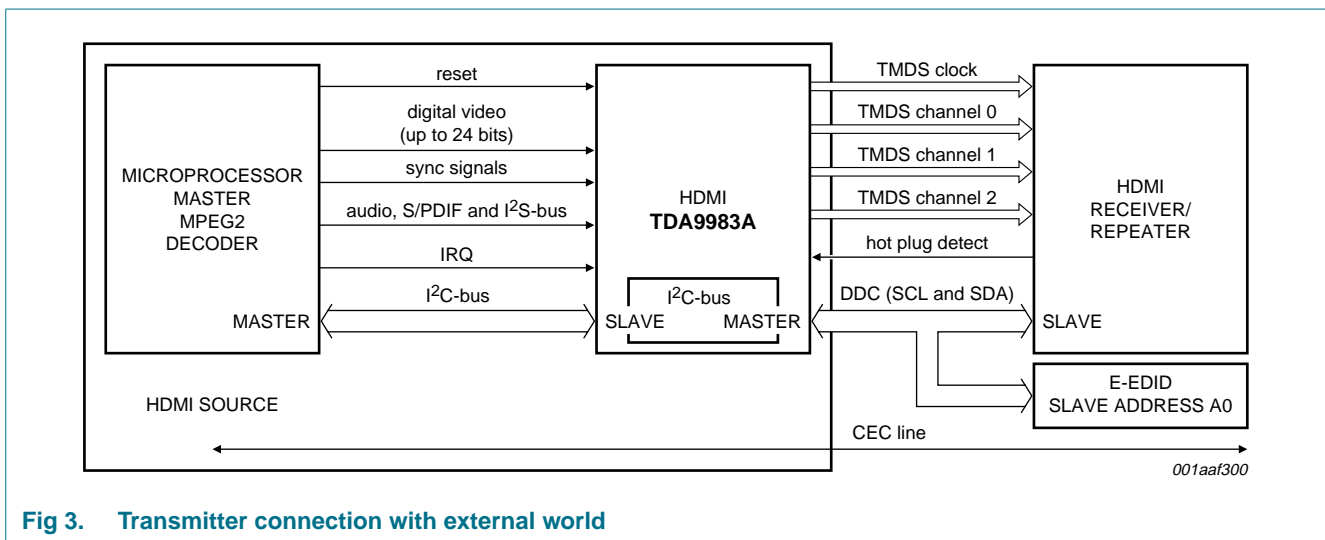
## 7. Limiting values

**Table 4. Limiting values**

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{DD(3V3)}$	supply voltage (3.3 V)		-0.5	+4.6	V
$V_{DD(1V8)}$	supply voltage (1.8 V)		-0.5	+2.5	V
$\Delta V_{DD}$	supply voltage difference		-0.5	+0.5	V
$T_{stg}$	storage temperature		-55	+150	°C
$T_{amb}$	ambient temperature		0	70	°C
$T_j$	junction temperature		-	125	°C
$V_{esd}$	electrostatic discharge voltage	HBM	-1500	+1500	V

## 8. Application information



**Fig 3. Transmitter connection with external world**

## 9. Abbreviations

**Table 5. Abbreviations**

Acronym	Description
CMOS	Complementary Metal-Oxide Semiconductor
DDC	Display Data Channel
DVI	Digital Visual Interface
HDCP	High-bandwidth Digital Content Protection
HBM	Human Body Model
HDMI	High-Definition Multimedia Interface
HPD	Hot Plug Detect
IRQ	Interrupt ReQuest
LV-TTL	Low-Voltage Transistor-Transistor Logic
OTP	One-Time Programmable

Table 5. Abbreviations ...continued

Acronym	Description
RGB	Red, Green, Blue
SHA-1	Secure Hash Algorithm 1
S/PDIF	Sony/Philips Digital Interface
Y <sub>C</sub> B <sub>R</sub>	color space originally defined by the ITU-R BT.601
YUV	color space used by the NTSC and PAL systems

## 10. Revision history

Table 6. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
TDA9983A_SDS_1	20080313	Product short data sheet	-	-

## 11. Legal information

### 11.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

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