12-Bit, SDTV/HDTV 3D Comb Filter, Video Decoder, and Graphics Digitizer

Data Sheet

ADV7802

FEATURES

- 4 noise shaped video (NSV) 12-bit ADCs
- True 12-bit high dynamic range processing
- 12-channel analog input mux
- 36-bit digital YCrCb/RGB output
- 12-bit deep color processing
- Analog monitor output
- NTSC/PAL/SECAM color standards support
- NTSC/PAL 3D comb filter
- 3D digital noise reduction (DNR)
- Advanced time-base correction (TBC) with frame synchronization
- Interlaced-to-progressive conversion for 525i and 625i
- Advanced VBI data slicer, including teletext, CC, and V-chip
- IF compensation filter
- SCART fast blank support including slow switch detect
- Programmable internal antialias filters
- Weak, poor time-base, and nonstandard signal support
- Vertical peaking, horizontal peaking, CTI, LTI
- Simultaneous interlaced and progressive parallel output for 525i/525p and 625i/625p
- 525p/625p component progressive scan support
- 720p/1080i/1080p component HDTV support
- Digitizes RGB graphics with maximum pixel clock rate of 135 MHz (ADV7802BSTZ-150 model only)
- 24-bit digital input port supports data from DVI/HDMI Rx IC
- Any-to-any, advanced 3 × 3 color space conversion matrix
- Flexible output pixel interface supporting 8-/10-/12-/16-/20-/24-/30-/36-bit SDR/DDR 4:2:2/4:4:4 data formats
- Programmable interrupt request output pin

APPLICATIONS

- AV receivers
- LCD HDTVs
- PDP HDTVs
- CRT HDTVs
- HDTV STBs with PVR
- DVD recorders with progressive scan input support
- Projectors

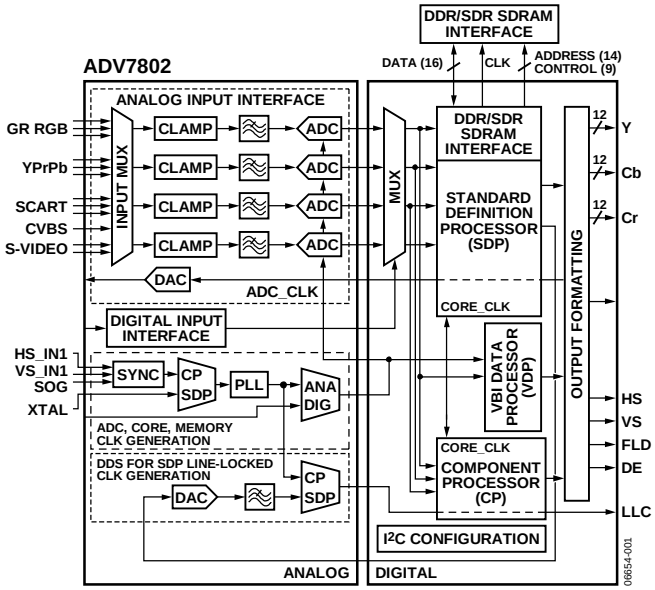


Figure 1. ADV7802 Block Diagram

GENERAL DESCRIPTION

The ADV7802[1] is a high quality, single-chip, multiformat 3D comb filter, video decoder, and graphics digitizer. This multiformat 3D comb filter decoder supports the conversion of PAL, NTSC, and SECAM standards in the form of a composite or an S-video into a digital ITU-R BT.656 format. The ADV7802 also supports the decoding of a component RGB/YPrPb video signal into a digital YCrCb or RGB pixel output stream.

The support for component video includes standards such as 525i, 625i, 525p, 625p, 720p, 1080i, 1080p, and many other HD and SMPTE standards. Graphics digitization is supported by the ADV7802; it is capable of digitizing RGB graphics signals from VGA to SXGA rates and converting them into a digital RGB or YCrCb pixel output stream. SCART and overlay functionality are enabled by the ability of the ADV7802 to simultaneously process CVBS and standard definition RGB signals.

The ADV7802 contains two main processing sections. The first section is the standard definition processor (SDP), which processes all PAL, NTSC, SECAM, and component (up to 525p/625p) signal types. The second section is the component processor (CP), which processes YPrPb and RGB component formats, including RGB graphics.

[1] Protected by U.S. Patent Number 4,907,093 and other intellectual property rights.

Advantiv™ Advanced Television Solutions by Analog Devices | NSV® Precision Video by Analog Devices

Rev. D

Information furnished by Analog Devices is believed to be accurate and reliable. However, no responsibility is assumed by Analog Devices for its use, nor for any infringements of patents or other rights of third parties that may result from its use. Specifications subject to change without notice. No license is granted by implication or otherwise under any patent or patent rights of Analog Devices. Trademarks and registered trademarks are the property of their respective owners.

One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106, U.S.A.
Tel: 781.329.4700 www.analog.com
Fax: 781.461.3113
©2011 Analog Devices, Inc. All rights reserved.

TABLE OF CONTENTS

Features ... 1
Applications ... 1
General Description ... 1
Revision History ... 2
Functional Block Diagram ... 3
Specifications ... 4
Electrical Characteristics ... 4
Video Specifications ... 6
Timing Characteristics ... 7
Timing Diagrams ... 8
Analog Specifications ... 9
Absolute Maximum Ratings ... 10
Package Thermal Performance ... 10
Thermal Resistance ... 10
ESD Caution ... 10
Pin Configuration and Function Descriptions ... 11
Theory of Operation ... 14
Key Features ... 14
Analog Front End ... 14
Standard Definition Processor ... 14
VBI Data Processor ... 15
Component Processor ... 15
Additional Features ... 16
Single Data Rate (SDR) ... 16
Double Data Rate (DDR) ... 16
Recommended External Loop Filter Components ... 17
Typical Connection Diagrams ... 18
Pixel Input/Output Formatting ... 21
Pixel Data Output Modes Highlights ... 21
Digital Video Input Port Highlights ... 21
Outline Dimensions ... 34
Ordering Guide ... 34

REVISION HISTORY

8/11—Revision D: Initial Version

FUNCTIONAL BLOCK DIAGRAM

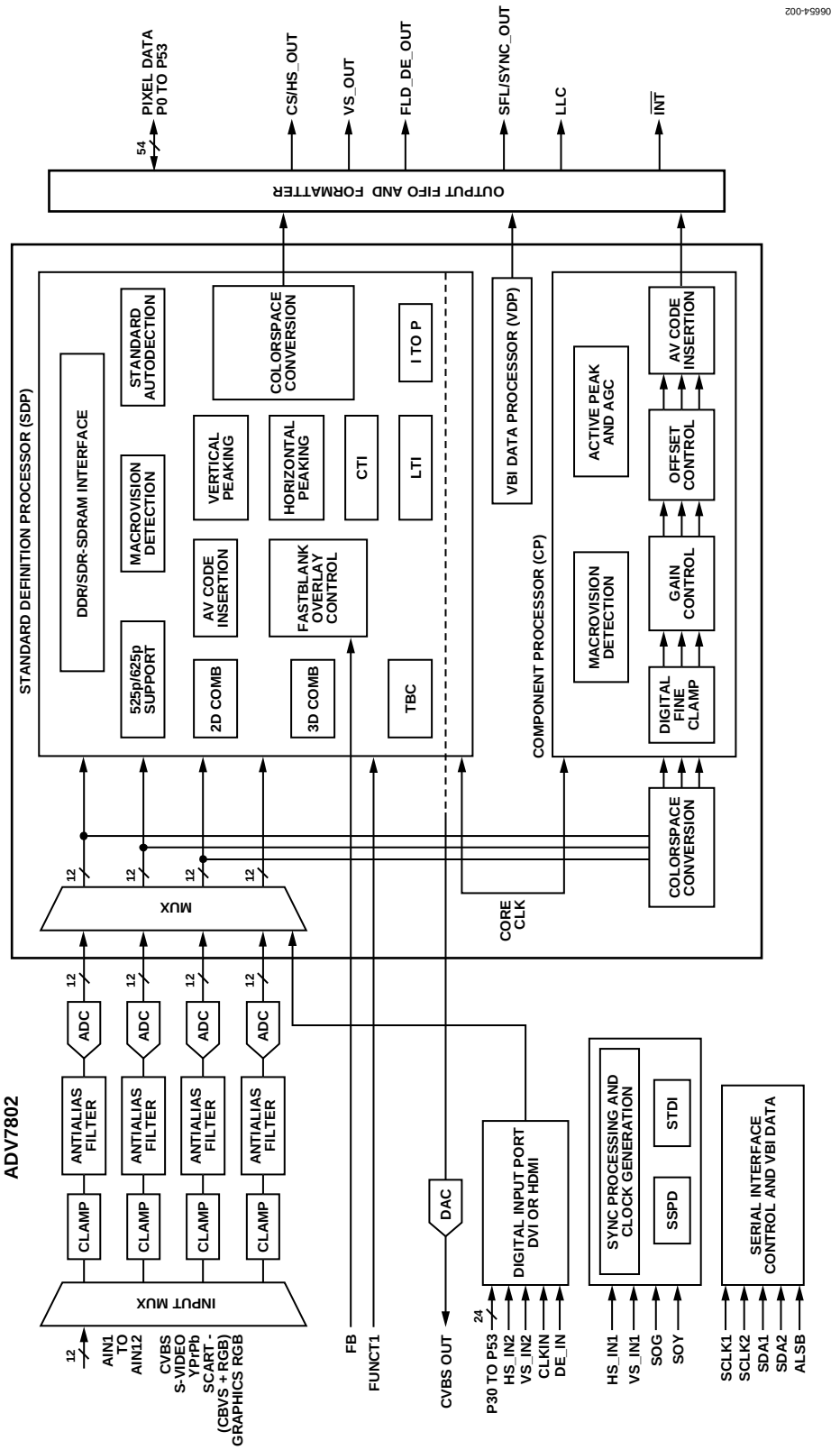


Figure 2.

SPECIFICATIONS

ELECTRICAL CHARACTERISTICS

AVDD = 3.15 V to 3.45 V, DVDD = 1.75 V to 1.85 V, DVDDIO = 3.0 V to 3.6 V, DVDDIO_SDRAM = 2.35 V to 2.65 V (DDR), DVDDIO_SDRAM = 3.2 V to 3.4 V (SDR), PVDD = 1.71 V to 1.89 V, nominal input range 1.6 V. T_A = 0°C to 85°C, unless otherwise noted.

Table 1.

Parameter[1]	Symbol	Test Conditions	Min	Typ	Max	Unit
STATIC PERFORMANCE[2, 3]						
Resolution (Each ADC)	N				12	Bits
Integral Nonlinearity[4]	INL	BSL at 27 MHz (at a 12-bit level)		−1.0/+1.5		LSB
		BSL at 54 MHz (at a 12-bit level)		−1.5/+2.0		LSB
		BSL at 74 MHz (at an 11-bit level)		−1.4/+1.2		LSB
		BSL at 110 MHz (at a 10-bit level)		−0.8/+2.0		LSB
		BSL at 150 MHz (at an 8-bit level)		−2.0/+2.0		LSB
Differential Nonlinearity[4]	DNL	At 27 MHz (at a 12-bit level)		−0.6/+0.7		LSB
		At 54 MHz (at a 12-bit level)		−0.6/+0.8		LSB
		At 74 MHz (at an 11-bit level)		−0.9/+0.75		LSB
		At 110 MHz (at a 10-bit level)		−0.5/+1.0		LSB
		At 150 MHz (at an 8-bit level)		−0.7/+1.5		LSB
POWER REQUIREMENTS[5]						
Digital Core Power Supply	DVDD		1.75	1.8	1.85	V
Digital I/O Power Supply	DVDDIO		3.0	3.3	3.6	V
PLL Power Supply	PVDD		1.71	1.8	1.89	V
Analog Power Supply	AVDD		3.15	3.3	3.45	V
Memory Interface Power Supply	DVDDIO_SDRAM	DDR	2.35	2.5	2.65	V
		SDR	3.2	3.3	3.4	V
Digital Core Supply Current	I_{DVDD}	CVBS input sampling at 54 MHz		236		mA
		Graphics RGB sampling at 78 MHz		103		mA
		SCART RGB FB sampling at 54 MHz		236		mA
		525p input sampling at 54 MHz		319		mA
		Graphics RGB sampling at 135 MHz		180		mA
		1080p sampling at 148.5 MHz		214		mA
Digital I/O Supply Current	I_{DVDDIO}	CVBS input sampling at 54 MHz		6		mA
		Graphics RGB sampling at 78 MHz		15		mA
		Graphics RGB sampling at 135 MHz		27		mA
		1080p sampling at 148.5 MHz		48		mA
PLL Supply Current	I_{PVDD}	CVBS input sampling at 54 MHz		13		mA
		Graphics RGB sampling at 78 MHz		10		mA
		Graphics RGB sampling at 135 MHz		10		mA
		1080p sampling at 148.5 MHz		11		mA
Analog Supply Current	I_{AVDD}	CVBS input sampling at 54 MHz		99		mA
		SCART RGB FB sampling at 54 MHz		269		mA
		Graphics RGB sampling at 78 MHz		263		mA
		Graphics RGB sampling at 135 MHz		286		mA
		1080p sampling at 148.5 MHz		288		mA
Memory Interface Supply Current	I_{VDDRAM}	CVBS input sampling at 54 MHz		17		mA
Power-Down Current	I_{PWRDN}			8		mA
Power-Up Time	t_{PWRUP}			20		ms
DIGITAL INPUTS						
Input High Voltage	V_{IH}			2		V
Input Low Voltage	V_{IL}			0.8		V
Input Current	I_{IN}			±10		µA
Input Capacitance	C_{IN}			15		pF

Parameter[1]	Symbol	Test Conditions	Min	Typ	Max	Unit
DIGITAL OUTPUTS						
Output High Voltage[6]	V_{OH}	I_{SOURCE} = 0.4 mA		2.4		V
Output Low Voltage[6]	V_{OL}	I_{SINK} = 3.2 mA		0.4		V
High Impedance Leakage Current	I_{LEAK}			10		µA
Output Capacitance	C_{OUT}			20		pF

[1] Temperature range T_{MIN} to T_{MAX}.
[2] All ADC linearity tests performed with part configured for component video input.
[3] All ADC linearity tests performed at input range of full scale − 12.5% and at zero scale + 12.5%.
[4] Maximum INL and DNL specifications obtained with part configured for component video input.
[5] Guaranteed by characterization.
[6] V_{OH} and V_{OL} levels obtained using default drive strength.

VIDEO SPECIFICATIONS

AVDD = 3.15 V to 3.45 V, DVDD = 1.75 V to 1.85 V, DVDDIO = 3.0 V to 3.6 V, DVDDIO_SDRAM = 2.4 V to 2.6 V (DDR), DVDDIO_SDRAM = 3.2 V to 3.4 V (SDR), PVDD = 1.71 V to 1.89 V, T_A = 0°C to 85°C, unless otherwise noted.

Table 2.

Parameter[1]	Symbol	Test Conditions	Min	Typ	Max	Unit
NONLINEAR SPECIFICATIONS						
Differential Phase	DP	CVBS input (modulated five-step)		0.45		Degrees
Differential Gain	DG	CVBS input (modulated five-step)		0.45		%
Luma Nonlinearity	LNL	CVBS input (modulated five-step)		0.7		%
NOISE SPECIFICATIONS						
SNR Unweighted		Luma ramp		63		dB
		Luma flat field		64		dB
Analog Front-End Crosstalk				60		dB
LOCK TIME SPECIFICATIONS (SDP)						
Horizontal Lock Range				±5		%
Vertical Lock Range			40		70	Hz
Subcarrier Lock Range, f_{SC}				±0.8		kHz
Color Lock-In Time				60		Lines
Sync Depth Range[2]			20		200	%
Color Burst Range			1		200	%
Vertical Lock Time				300		ms
Horizontal Lock Time				100		Lines
CHROMA SPECIFICATIONS (SDP)						
Chroma Amplitude Error				0.4		%
Chroma Phase Error				0.3		Degrees
Chroma Luma Intermodulation				0.2		%

[1] Guaranteed by characterization.
[2] Nominal sync depth is 300 mV at 100% sync depth range.

TIMING CHARACTERISTICS

AVDD = 3.15 V to 3.45 V, DVDD = 1.75 V to 1.85 V, DVDDIO = 3.0 V to 3.6 V, DVDDIO_SDRAM = 2.4 V to 2.6 V (DDR), DVDDIO_SDRAM = 3.2 V to 3.4 V (SDR), PVDD = 1.71 V to 1.89 V, T_A = 0°C to 85°C, unless otherwise noted.

Table 3.

Parameter[1]	Symbol	Test Conditions	Min	Typ	Max	Unit
SYSTEM CLOCK AND CRYSTAL						
Crystal Nominal Frequency				28.63636		MHz
Crystal Frequency Stability					±50	ppm
Horizontal Sync Input Frequency			14.8		90	kHz
LLC Frequency Range			12.825		150	MHz
I²C PORT						
SCLK Frequency					400	kHz
SCLK Minimum Pulse Width High	t_1		0.6			µs
SCLK Minimum Pulse Width Low	t_2		1.3			µs
Hold Time (Start Condition)	t_3		0.6			µs
Setup Time (Start Condition)	t_4		0.6			µs
SDA Setup Time	t_5		100			ns
SCLK and SDA Rise Time	t_6				300	ns
SCLK and SDA Fall Time	t_7				300	ns
Setup Time (Stop Condition)	t_8			0.6		µs
FAST I²C PORT[2]						
SCLK Frequency					3.4	MHz
SCLK Minimum Pulse Width High	t_1		60			ns
SCLK Minimum Pulse Width Low	t_2		160			ns
Hold Time (Start Condition)	t_3		160			ns
Setup Time (Start Condition)	t_4		160			ns
SDA Setup Time	t_5		10			ns
SCLK and SDA Rise Time	t_6		10		80	ns
SCLK and SDA Fall Time	t_7		10		80	ns
Setup Time (Stop Condition)	t_8		160			ns
RESET FEATURE						
Reset Pulse Width			5			ms
CLOCK OUTPUTS						
LLC Mark Space Ratio	t_9, t_{10}		45:55		55:45	% duty cycle
PIXEL PORT DATA AND CONTROL OUTPUTS[3]						
Data Output Transition Time, SDR	t_{11}	Negative clock edge to start of valid data			4.5	ns
Data Output Transition Time, SDR	t_{12}	End of valid data to negative clock edge			0	ns
Data Output Transition Time, SDR (CP Core)	t_{13}	Negative clock edge to start of valid data			2.5	ns
Data Output Transition Time, SDR (CP Core)	t_{14}	End of valid data to negative clock edge			0.2	ns
DATA AND CONTROL INPUTS[4]						
Input Setup Time (Digital Input Port)	t_{17}	HS_IN1, VS_IN1, HS_IN2, VS_IN2	9.5			ns
		DE_IN, data inputs	2			ns
Input Hold Time (Digital Input Port)	t_{18}	HS_IN1, VS_IN1, HS_IN2, VS_IN2	−4			ns
		DE_IN, data inputs	0.8			ns

[1] Guaranteed by characterization.
[2] With a bus line load less than 100 pF.
[3] Timing figures obtained using default drive strength value.
[4] TTL input values are 0 V to 3 V, with rise/fall times ≥ 3 ns, measured between the 10% and 90% points.

TIMING DIAGRAMS

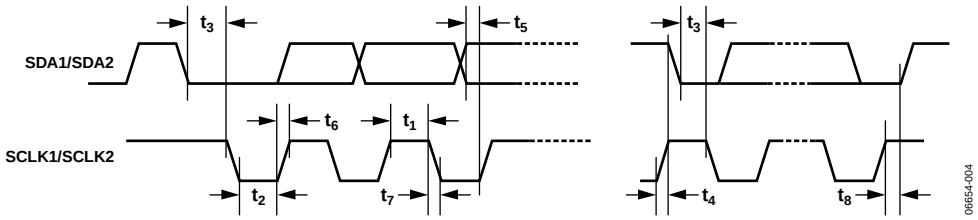


Figure 3. I²C Timing

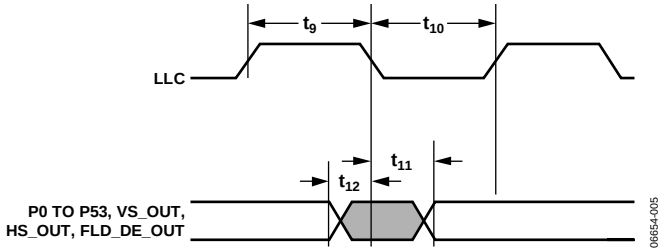


Figure 4. Pixel Port and Control SDR Output Timing (SD Core)

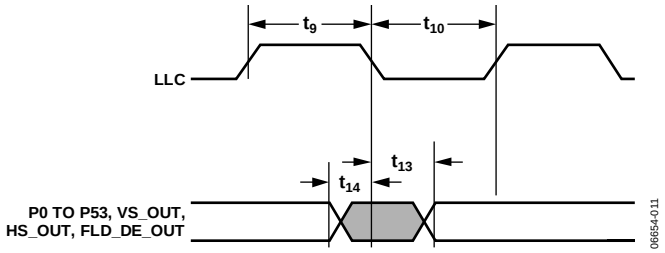


Figure 5. Pixel Port and Control SDR Output Timing (CP Core)

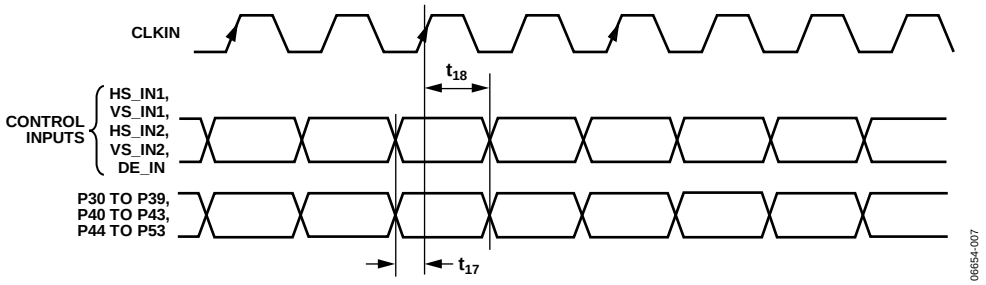


Figure 6. Digital Input Port and Control Input Timing

ANALOG SPECIFICATIONS

AVDD = 3.15 V to 3.45 V, DVDD = 1.75 V to 1.85 V, DVDDIO = 3.0 V to 3.6 V, DVDDIO_SDRAM = 2.4 V to 2.6 V (DDR), DVDDIO_SDRAM = 3.2 V to 3.4 V (SDR), PVDD = 1.71 V to 1.89 V, T_A = 0°C to 85°C, unless otherwise noted. Recommended analog input video signal range is 0.5 V to 1.6 V, typically 1 V p-p. Recommended external clamp capacitor value is 0.1 µF.

Table 4.

Parameter[1, 2]	Test Conditions	Min	Typ	Max	Unit
CLAMP CIRCUITRY					
Input Impedance[3]	Clamps switched off		10		MΩ
Input Impedance of Pin 90 (FB)			20		kΩ
CML			2.0		V
ADC Full-Scale Level			CML + 0.8		V
ADC Zero-Scale Level			CML – 0.8		V
ADC Dynamic Range			1.6		V
Clamp Level (When Locked)	CVBS input		CML – 0.292		V
	SCART RGB input (R, G, B signals)		CML – 0.3		V
	S-Video input (Y signal)		CML – 0.292		V
	S-Video input (C signal)		CML – 0		V
	Component input (Y signal)		CML – 0.3		V
	Component input (Pr, Pb signals)		CML – 0		V
	PC RGB input (R, G, B signals)		CML – 0.3		V
Large Clamp Source Current	SDP only		0.75		mA
Large Clamp Sink Current	SDP only		0.9		mA
Fine Clamp Source Current	SDP only		17		µA
Fine Clamp Sink Current	SDP only		17		µA

[1] The minimum/maximum specifications are guaranteed over 0°C to 85°C.
[2] Guaranteed by characterization.
[3] Except Pin 90 (FB).

ABSOLUTE MAXIMUM RATINGS

Table 5.

Parameter	Rating
AVDD to AGND	4.0 V
DVDD to DGND	2.2 V
PVDD to AGND	2.2 V
DVDDIO to DGND	4.0 V
DVDDIO_SDRAM to DGND_SDRAM (DDR)	2.7 V
DVDDIO_SDRAM to DGND_SDRAM (SDR)	4.0 V
DVDDIO to AVDD	−0.3 V to +0.3 V
DVDDIO to DVDD	−0.3 V to +2 V
DVDDIO_SDRAM to DVDD (DDR)	−0.3 V to +2.5 V
DVDDIO_SDRAM to DVDD (SDR)	−0.3 V to +3.3 V
AVDD to PVDD	−0.3 V to +2 V
AVDD to DVDD	−0.3 V to +2 V
DVDDIO to DVDDIO_SDRAM (DDR)	−0.3 V to +2 V
DVDDIO to DVDDIO_SDRAM (SDR)	−0.3 V to +3.3 V
AVDD to DVDDIO_SDRAM (DDR)	−0.3 V to +2.5 V
AVDD to DVDDIO_SDRAM (SDR)	−0.3 V to +1.8 V
Digital Inputs Voltage to DGND	DGND − 0.3 V to DVDDIO + 0.3 V
DVDDIO_SDRAM Inputs to DGND_SDRAM	DGND_SDRAM − 0.3 V to DVDDIO_SDRAM + 0.3 V
Analog Inputs to AGND	AGND − 0.3 V to AVDD + 0.3 V
SCLK/SDA Data Pins to DVDDIO	DVDDIO − 0.3 V to DVDDIO + 3.6 V
Maximum Junction Temperature ($T_{J\ MAX}$)	125°C
Storage Temperature Range	−65°C to +150°C
Infrared Reflow Soldering (20 sec)	260°C

Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; functional operation of the device at these or any other conditions above those indicated in the operational section of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

PACKAGE THERMAL PERFORMANCE

To reduce power consumption when using the part, the user is advised to turn off any unused ADCs.

The junction temperature must always stay below the maximum junction temperature ($T_{J\ MAX}$) of 125°C. The following equation shows how to calculate the junction temperature:

$$T_J = T_{A\ MAX} + (\theta_{JA} \times W_{MAX})$$

where:
$T_{A\ MAX} = 85°C$.
$\theta_{JA} = 21.0330°C/W$.
$W_{MAX} = ((AVDD \times I_{AVDD}) + (DVDD \times I_{DVDD}) + (DVDDIO \times I_{DVDDIO}) + (PVDD \times I_{PVDD}) + (DVDDIO_SDRAM \times DVDDIO_SDRAM))$.

THERMAL RESISTANCE

θ_{JA} is specified for the worst-case conditions, that is, a device soldered in a circuit board for surface-mount packages.

Table 6. Thermal Resistance

Package Type	θ_{JA}[1]	θ_{JC}[2]	Unit
176-Lead LQFP	21	7	°C/W

[1] 4-layer PCB with solid ground plane.
[2] 4-layer PCB with solid ground plane (still air).

ESD CAUTION



ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

PIN CONFIGURATION AND FUNCTION DESCRIPTIONS

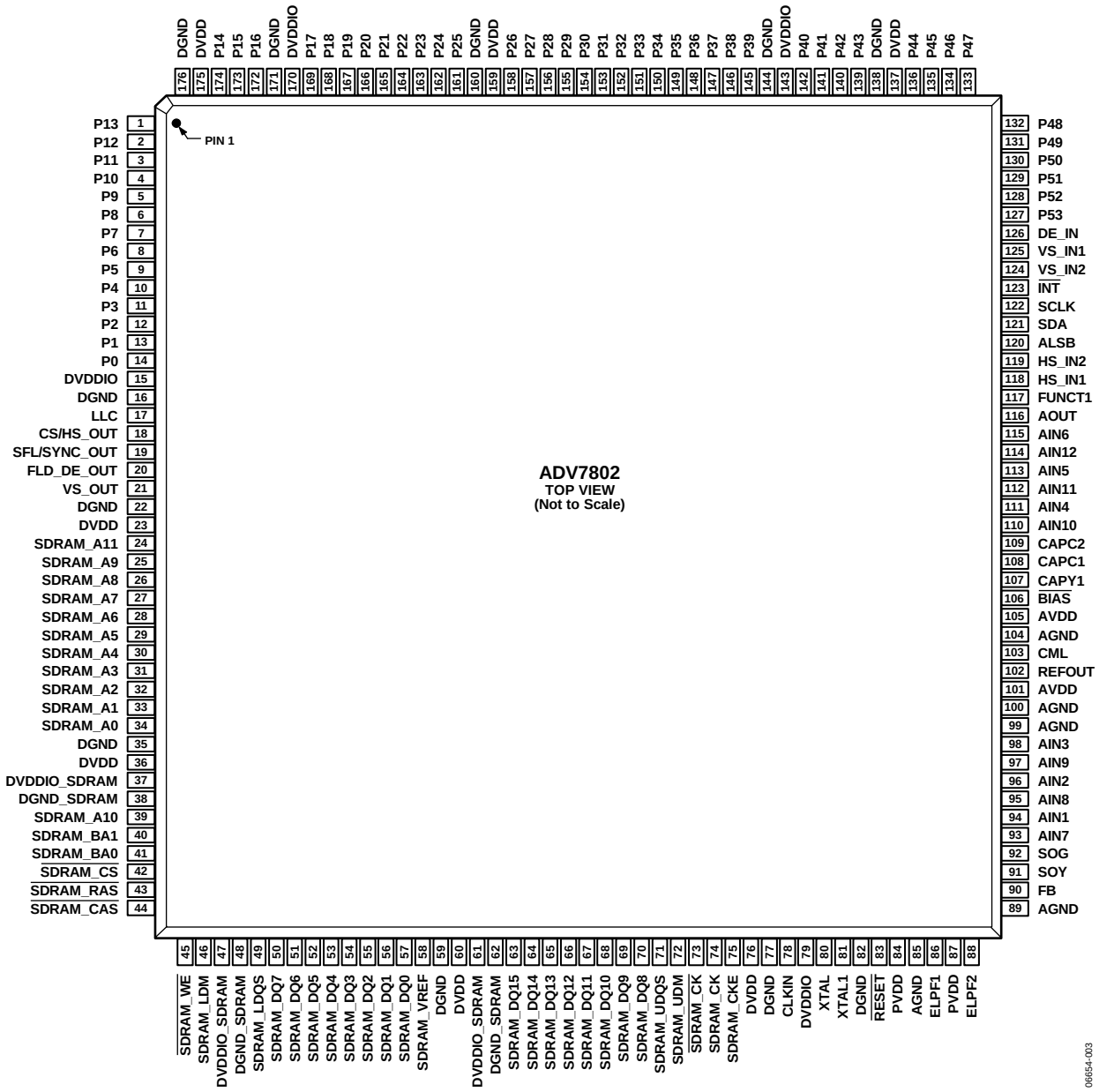


Figure 7. Pin Configuration

Table 7. Pin Function Descriptions

Pin No.	Mnemonic	Type[1]	Description
1 to 14, 155 to 158, 161 to 169, 172 to 174	P0 to P29	O	Video Pixel Output Port. See Figure 7 for details on pin mapping.
15, 79, 143, 170	DVDDIO	P	Digital Input/Output Supply Voltage (3.3 V).
16, 22, 35, 59, 77, 82, 138, 144, 160, 171, 176	DGND	GND	Digital Ground.
17	LLC	O	Line-Locked Output Clock for the Pixel Data.
18	CS/HS_OUT	O	Horizontal Synchronization or Composite Synchronization Signal. This signal can be selected while in SDP mode.
19	SFL/SYNC_OUT	O	Subcarrier Frequency Lock. This pin contains a serial output stream, which can be used to lock the subcarrier frequency when this decoder is connected to any digital video encoder from Analog Devices, Inc. SYNC_OUT is the sliced synchronization output signal available only in CP mode.
20	FLD_DE_OUT	O	Field Synchronization Output Signal (All Interlaced Video Modes). This pin also can be enabled as a data enable signal (DE) to allow direct connection to an HDMI™/DVI Tx IC.
21	VS_OUT	O	Vertical Synchronization Output Signal (SDP and CP Modes).
23, 36, 60, 76, 137, 159, 175	DVDD	P	Digital Core Supply Voltage (1.8 V).
24 to 34, 39	SDRAM_A0 to SDRAM_A11	O	Address Outputs. Interface to external RAM address lines. See Figure 7 for details on pin mapping.
37, 47, 61	DVDDIO_SDRAM	P	External Memory Interface Digital Input/Output Supply (DDR 2.5 V or SDR 3.3 V).
38, 48, 62	DGND_SDRAM	GND	External Memory Interface Digital GND.
40, 41	SDRAM_BA1 to SDRAM_BA0	O	Bank Address Outputs. Interface to external RAM bank address lines.
42	$\overline{\text{SDRAM_CS}}$	O	Chip Select. $\overline{\text{SDRAM_CS}}$ enables and disables the command decoder on the RAM.
43	$\overline{\text{SDRAM_RAS}}$	O	Row Address Select Command Signal. $\overline{\text{SDRAM_RAS}}$, $\overline{\text{SDRAM_CAS}}$, $\overline{\text{SDRAM_WE}}$, and $\overline{\text{SDRAM_CS}}$ define the command to the RAM.
44	$\overline{\text{SDRAM_CAS}}$	O	Column Address Select Command Signal. $\overline{\text{SDRAM_RAS}}$, $\overline{\text{SDRAM_CAS}}$, $\overline{\text{SDRAM_WE}}$, and $\overline{\text{SDRAM_CS}}$ define the command to the RAM.
45	$\overline{\text{SDRAM_WE}}$	O	Write Enable Output Command Signal. $\overline{\text{SDRAM_RAS}}$, $\overline{\text{SDRAM_CAS}}$, $\overline{\text{SDRAM_WE}}$, and $\overline{\text{SDRAM_CS}}$ define the command to the RAM.
46, 72	SDRAM_LDM, SDRAM_UDM	O	Data Mask Output. Data is masked when DM is high, for writing data to the external RAM. LDM corresponds to the data on SDRAM_DQ0 to SDRAM_DQ7, and UDM corresponds to the data on SDRAM_DQ8 to SDRAM_DQ15.
49	SDRAM_LDQS	I/O	Lower Data Strobe Pin. Data strobe pins are used for the RAM interface. This is an output with read data and an input with write data. It is edge aligned with write data and centered in read data. SDRAM_ LDQS corresponds to the data on SDRAM_DQ0 to SDRAM_DQ7.
50 to 57, 63 to 70	SDRAM_DQ0 to SDRAM_DQ15	I/O	Data Bus. Interface to external RAM 16-bit data bus. See Figure 7 for details on pin mapping.
58	SDRAM_VREF	P	1.25 V reference for the DDR SDRAM interface or 1.65 V for SDR.
71	SDRAM_UDQS	I/O	Upper Data Strobe Pin. Data strobe pins for the RAM interface. This is an output with read data and an input with write data. It is edge aligned with write data and centered in read data. SDRAM_UDQS corresponds to the data on SDRAM_DQ8 to SDRAM_DQ16.
73, 74	$\overline{\text{SDRAM_CK}}$, SDRAM_CK	O	Differential Clock Output. All address and control output signals to the RAM should be sampled on the positive edge of SDRAM_CK and on the negative edge of $\overline{\text{SDRAM_CK}}$.
75	SDRAM_CKE	O	Clock Enable. This pin is used as an enable to the clock signals of the external RAM.
78	CLKIN	I	Clock Input Signal. Used in 24-bit digital input mode (for example, processing 24-bit RGB data from a DVI/HDMI Rx IC and also in digital CVBS input mode).
80	XTAL	I	Crystal Input. Input pin for 28.63636 MHz crystal.
81	XTAL1	O	Crystal Output. This pin should be connected to the 28.63636 MHz crystal.

Pin No.	Mnemonic	Type[1]	Description
83	$\overline{\text{RESET}}$	I	System Reset Input. Active low. A minimum low reset pulse width of 5 ms is required to reset the ADV7802 circuitry.
84, 87	PVDD	P	PLL Supply Voltage (1.8 V).
85, 89, 99, 100, 104	AGND	GND	Analog Ground.
86, 88	ELPF1, ELPF2	I	External Loop Filter. The recommend external loop filter must be connected to each ELPF pin (see Figure 8).
90	FB	I	SCART Fast Blank Input.
91	SOY	I	Sync On Luma Input. Used in embedded synchronization mode.
92	SOG	I	Sync On Green Input. Used in embedded synchronization mode.
93 to 98, 110 to 115	AIN1 to AIN12	I	Analog Video Input Channels. See Figure 7 for details on pin mapping.
101, 105	AVDD	P	Analog Supply Voltage (3.3 V).
102	REFOUT	O	Internal Voltage Reference Output.
103	CML	O	Common-Mode Level Pin Used for the Internal ADCs.
106	$\overline{\text{BIAS}}$	O	External Bias Setting Pin. Connect the recommended resistor (1.35 kΩ) between the pin and ground.
107	CAPY1	I	ADC Capacitor Network.
108, 109	CAPC1, CAPC2	I	ADC Capacitor Network.
116	AOUT	O	Analog Monitor Output.
117	FUNCT1	I	SCART Function Select Input.
118	HS_IN1	I	Horizontal Synchronization Input Signal. Used in CP mode for 5-wire timing mode.
119	HS_IN2	I/O	Horizontal Synchronization Input Signal. Used in 24-bit digital input mode port mode (for example, processing 24-bit RGB data from an HDMI Rx IC). HS_IN2 in conjunction with VS_IN2 can be configured as a fast I^2C interface for teletext data extraction. HS_IN2 is used as the I^2C port serial clock input.
120	ALSB	I	ALSB selects the I^2C address for the ADV7802 control. ALSB set to Logic 0 configures the address for a write to the input/output port of 0x40. ALSB set to Logic 1 configures the address for a write to the input/output port of 0x42.
121	SDA	I/O	I^2C Port Serial Data Input/Output Pin.
122	SCLK	I	I^2C Port Serial Clock Input (Maximum Clock Rate of 400 kHz).
123	$\overline{\text{INT}}$	O	Interrupt Output. This pin can be active low or active high. When SDP/CP status bits change, this pin triggers. The set of events that triggers an interrupt is under user control.
124	VS_IN2	I/O	Vertical Synchronization Input Signal. Used in 24-bit digital input port mode (for example, processing 24-bit RGB data from an DVI/HDMI Rx IC). VS_IN2 in conjunction with HS_IN2 can be configured as a fast I^2C interface for teletext data extraction. VS_IN2 is used as the I^2C port serial data input/output pins.
125	VS_IN1	I	Vertical Synchronization Input Signal. Used in CP mode for 5-wire timing mode.
126	DE_IN	I	Data Enable Input Signal. Used in 24-bit digital input port mode (for example, processing 24-bit RGB data from an DVI/HDMI Rx IC).
127 to 136, 139 to 142, 145 to 154	P30 to P53	I/O	Video Pixel Input/Output Port. See Figure 7 for details on pin mapping.

[1] GND = ground, I = input, I/O = input/output, O = output, P = power.

THEORY OF OPERATION

KEY FEATURES

The ADV7802 is a high quality, single-chip, multiformat 3D comb filter video decoder and graphics digitizer. Key features of the device include

- Four noise shaped video (NSV®) 12-bit ADCs
- NTSC/PAL/SECAM video decoder
- Adaptive 3D comb filtering
- 3D digital noise reduction
- Advanced frame time-base correction (TBC)
- Composite, S-Video, YPrPb/RGB SCART support
- YPrPb component HD and RGB graphics input support
- 36-bit digital YPrPb/RGB output supporting 12-bit deep color

ANALOG FRONT END

The ADV7802 analog front end comprises four 12-bit NSV ADCs that digitize the analog video signal before applying it to the SDP or CP.

The front end includes a 12-channel input mux that enables multiple video signals to be applied to the ADV7802 without the requirement of an external mux. Current and voltage clamps are positioned in front of each ADC to ensure that the video signal remains within the range of the converter.

The ADCs are configured to run up to 4× oversampling mode when decoding composite and S-Video inputs or components up to 525i and 625i. For 525p and 625p, 2× oversampling is available. All other video standards are 1× oversampled. In oversampling the video signals, a reduction in the cost and complexity of external antialiasing filters can be obtained with the benefit of an increased signal-to-noise ratio (SNR).

Optional internal antialiasing filters with programmable bandwidth are positioned in front of each ADC. These filters can be used to band-limit standard definition (SD) video signals, removing spurious, out-of-band noise.

The ADV7802 can support simultaneous processing of CVBS and RGB standard definition signals to enable SCART compatibility and overlay functionality. A combination of CVBS and RGB inputs can be mixed, and the output is under the control of I^2C registers and the fast blank pin.

Analog front-end features include

- Four 150 MHz, NSV, 12-bit ADCs that enable true 12-bit video decoding
- 12-channel analog input mux that enables multiple source connections without the requirement of an external mux
- Four current and voltage clamp control loops that ensure that any dc offsets are removed from the video signal
- SCART functionality and SD RGB overlay on CVBS controlled by fast blank input
- SCART source switching detection through FUNCT1 input
- Four programmable antialias filters on standard definition video signals and enhance definition
- CVBS monitor output

STANDARD DEFINITION PROCESSOR

The standard definition processor (SDP) is capable of decoding a large selection of baseband video signals in composite, S-Video, and YUV formats. The video standards supported by the SDP include PAL, PAL 60, PAL M, PAL N, PAL Nc, NTSC M/J, NTSC 4.43, and SECAM. The ADV7802 can automatically detect the video standard and process it accordingly. The ADV7802 can process video up to 525p/625p formats.

The SDP has a 3D temporal comb filter and a five-line super adaptive 2D comb filter that gives superior chrominance and luminance separation when decoding a composite video signal. This highly adaptive filter automatically adjusts its processing mode according to the video standard and signal quality with no user intervention required. The SDP has an IF filter block that compensates for attenuation in the high frequency chroma spectrum due to a tuner SAW filter. The SDP has specific luminance and chrominance parameter controls for brightness, contrast, saturation, and hue.

The ADV7802 implements a patented adaptive digital line length tracking (ADLLT) algorithm to track varying video line lengths from sources such as a VCR. ADLLT enables the ADV7802 to track and decode poor quality video sources (such as VCRs) and noisy sources (such as tuner outputs, VCR players, and camcorders). Frame TBC ensures stable clock synchronization between the decoder and the downstream devices.

The SDP also contains both a luma transient improvement (LTI) and a chroma transient improvement (CTI) processor. This processor increases the edge rate on the luma and chroma transitions, resulting in a sharper video image.

The SDP has a Macrovision® detection circuit, which allows Type I, Type II, and Type III Macrovision protection levels. The decoder is also fully robust to all Macrovision signal inputs.

SDP features include

- Advanced adaptive 3D comb with concurrent 3D noise reduction (using external DDR SDRAM memory)
- Adaptive 2D five-line comb filters for NTSC and PAL that give superior chrominance and luminance separation for composite video
- Full automatic detection and autoswitching of all worldwide standards (PAL, NTSC, and SECAM)
- Automatic gain control with white peak mode that ensures that the video is always processed without loss of the video processing range
- Proprietary architecture for locking to weak, noisy, and unstable sources from VCRs and tuners
- IF filter block that compensates for high frequency luma attenuation due to tuner SAW filter
- LTI and CTI
- Vertical and horizontal programmable luma peaking filters
- True full 12-bit deep color processing path from front to back end in 4:4:4/4:2:2 RGB/YCrCb formats
- 4× oversampling (54 MHz) for CVBS, S-Video, and YUV modes
- Line-locked clock output (LLC)
- Free run output mode that provides stable timing when no video input is present
- Internal color bar test pattern
- Advanced TBC with frame synchronization, which ensures nominal clock and data for nonstandard input
- Interlace-to-progressive conversion for 525i and 625i formats, enabling direct drive of HDMI Tx devices
- Color controls that include hue, brightness, saturation, and contrast
- Differential gain (DG), typically 0.45%
- Differential phase (DP), typically 0.45°

VBI DATA PROCESSOR

The VBI data processor (VDP) of the ADV7802 is capable of slicing multiple vertical blanking interval data standards on SD video and component video. The VDP decodes the VBI data on the incoming CVBS/YC or YUV data processed by the SDP core. It can also decode VBI data on the luma channel of YUV data processed through the CP core.

The VDP can process a variety of VBI data standards, such as

- Teletext
- Video programming system (VPS)
- Vertical interval time codes (VITC)
- Closed captioning (CC) and extended data service (EDS)
- Wide screen signaling (WSS)
- Copy generation management system (CGMS, CGMS Type B)
- Gemstar® 1×/2× electronic program guide compatible
- Extended data service (SDS); the data extracted can be read back over a fast I^2C interface

COMPONENT PROCESSOR

The component processor (CP) is capable of decoding and digitizing a wide range of component video formats in any color space. The CP can accept video data from the analog front end or from the HDMI receiver. Component video standards supported by the CP include 525i, 625i, 525p, 625p, 720p, 1080i, 1080p, and VGA (up to SXGA at 75 Hz), and many other standards.

A fully programmable any-to-any, 3 × 3 color space conversion (CSC) matrix is placed before the CP. This enables YPrPb-to-RGB and RGB-to-YCrCb conversions of video data coming from the analog front end or from the HDMI receiver. Many other standards of color space can be implemented using the color space converter.

The CP of the ADV7802 contains an automatic gain control (AGC) block. The AGC is followed by a clamp circuit that ensures that the video signal is clamped to the correct blanking level. Automatic adjustments within the CP include gain (contrast) and offset (brightness). Manual adjustment controls are also supported. In cases where no embedded synchronization is preset, the video gain can be set manually.

The CP contains circuitry to enable the detection of Macrovision encoded YPrPb signals for 525i, 625i, 525p, and 625p. It is designed to be fully robust to these types of signals.

CP features include

- 525i, 625i, 525p, 625p, 720p, 1080i, 1080p, and many other HDTV formats supported
- Automatic adjustments including gain (contrast) and offset (brightness); manual adjustment controls are also supported
- Support for analog component YPrPb and RGB video formats with embedded synchronization or with separate HS, VS, or CS
- Any-to-any, 3 × 3 color space conversion matrix that supports YCrCb-to-RGB and RGB-to-YCrCb, fully programmable or preprogrammable configurations
- Synchronization source polarity detector (SSPD) that determines the source and polarity of the synchronization signals that accompany the input video
- Macrovision copy protection detection on component formats (525i, 625i, 525p, and 625p)
- Free run output mode that provides stable timing when no video input is present
- Arbitrary pixel sampling support for nonstandard video sources
- 135 MHz graphics processing, supporting RGB input resolutions up to 1280 × 1024 at 75 Hz
- Automatic or manual clamp-and-gain controls for graphics modes
- Contrast, brightness, hue, and saturation controls
- 32-phase DLL that allows optimum pixel clock sampling
- Automatic detection of synchronization source and polarity by SSPD block
- Standard identification enabled by STDI block
- RGB that can be color space converted to YCrCb and decimated to a 4:2:2 format for videocentric back-end IC interfacing
- Data enable (DE) output signal supplied for direct connection to HDMI/DVI Tx IC
- Arbitrary pixel sampling support for nonstandard video sources

ADDITIONAL FEATURES

The ADV7802 also includes

- HS, VS, FIELD, and DE output signals with programmable position, polarity, and width
- Programmable interrupt request output pin ($\overline{\text{INT}}$) that signals SDP/CP status changes
- Two I^2C host port interface (control and VBI) support
- Integrated programmable antialiasing filters
- 176-lead, 26 mm × 26 mm, RoHS-compliant LQFP

For more detailed product information about the ADV7802, contact a local Analog Devices sales representative.

SINGLE DATA RATE (SDR)

The ADV7802 uses SDR external memory[1] for 3D comb, frame synchronizer operation, or 3D-DNR nonconcurrent operation.

- 64 Mb SDR SDRAM minimum memory requirement.
- The memory architecture required is four banks of 1 Mb × 16.
- Speed grade of 133 MHz at CAS latency (CL) 3 is required.
- 22 Ω series termination resistors are recommended for this configuration.
- Recommended memory that is compatible with the ADV7802 includes the MT48LC4M16A2 from Micron.

DOUBLE DATA RATE (DDR)

The ADV7802 uses DDR external memory[1] for simultaneous 3D comb, frame synchronizer, and 3D-DNR operation.

- 128 Mb DDR SDRAM minimum memory requirement.
- The memory architecture required is four banks of 2 Mb × 16.
- Speed grade of 133 MHz at CAS latency (CL) 2.5 is required.
- Termination resistors not recommended for this configuration.
- Recommended memory that is compatible with the ADV7802 includes K4H281638B-TCB0 from Samsung, the MT46V8M16-TGP-75 from Micron, and the HYB25D128160CE-6 from Infineon.

[1] When external memory is not connected, IO Map Register 0x29[4] should be set high directly after reset.

RECOMMENDED EXTERNAL LOOP FILTER COMPONENTS

The external loop filter components for the ELPF pins should be placed as close as possible to the respective pins. Figure 8 shows the recommended component values.

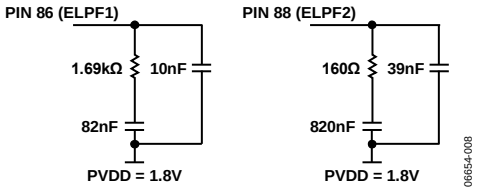


Figure 8. ELPF Components

TYPICAL CONNECTION DIAGRAMS

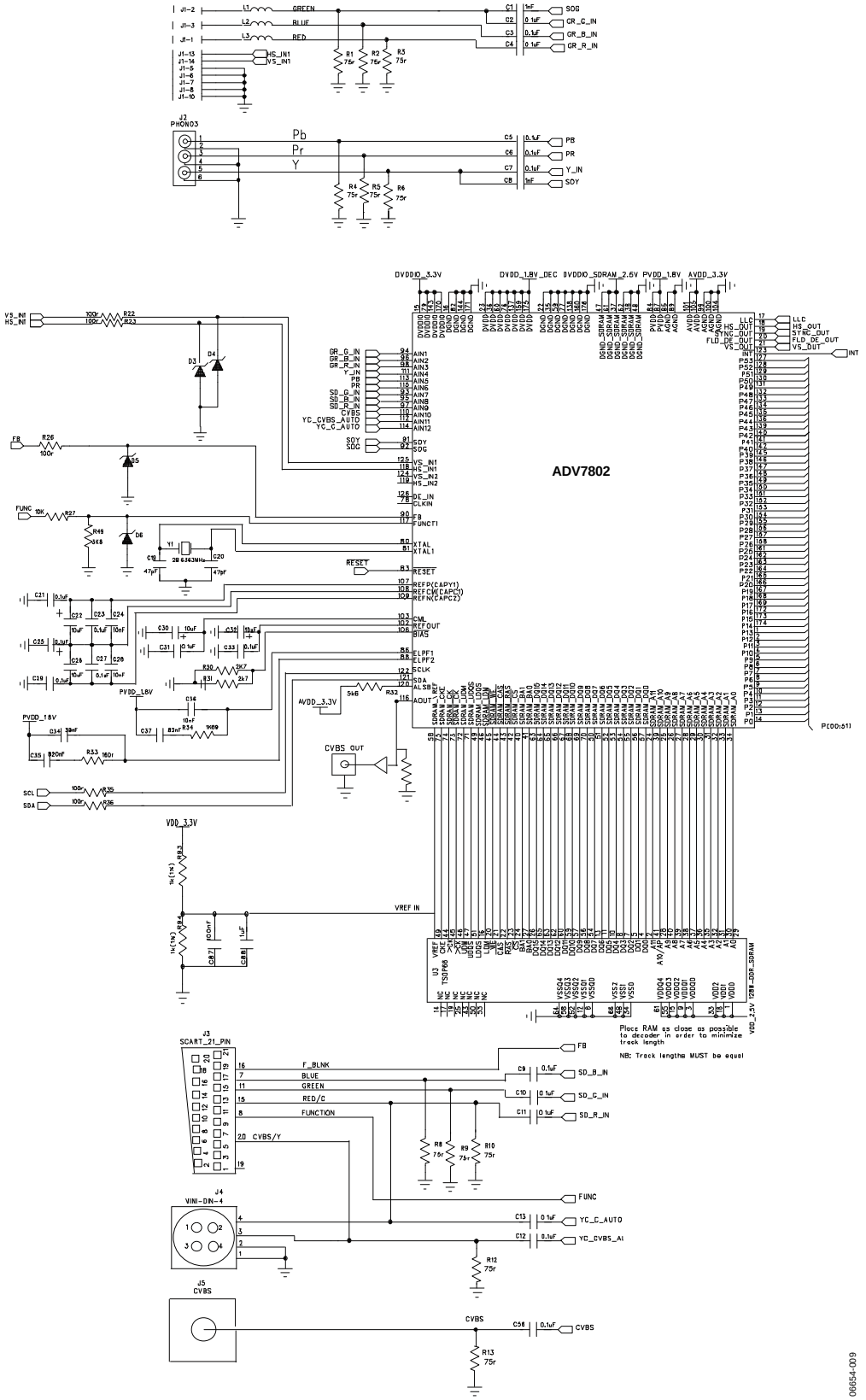


Figure 9. Typical Connection Diagram (External DDR Memory)

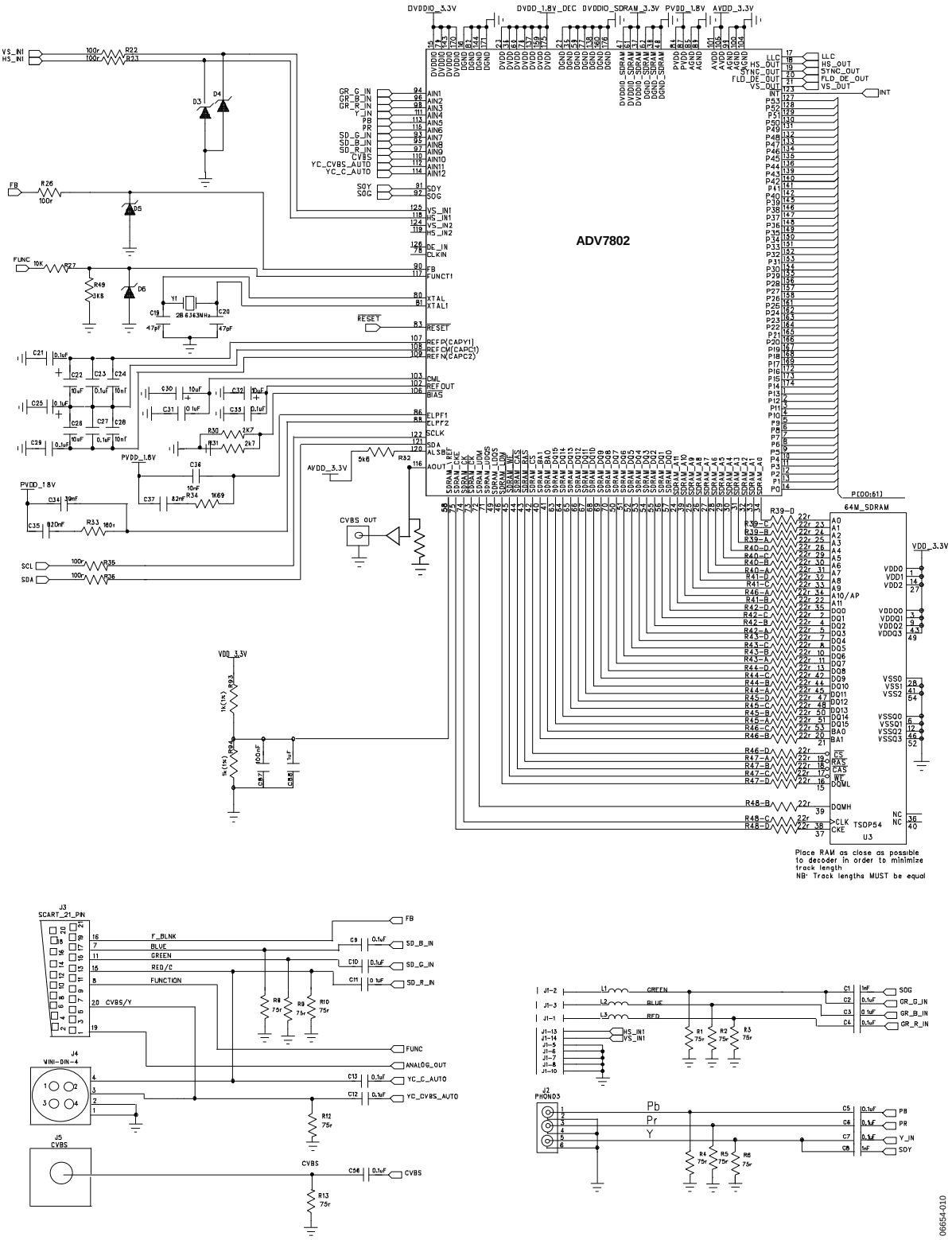


Figure 10. Typical Connection Diagram (External SDR Memory)

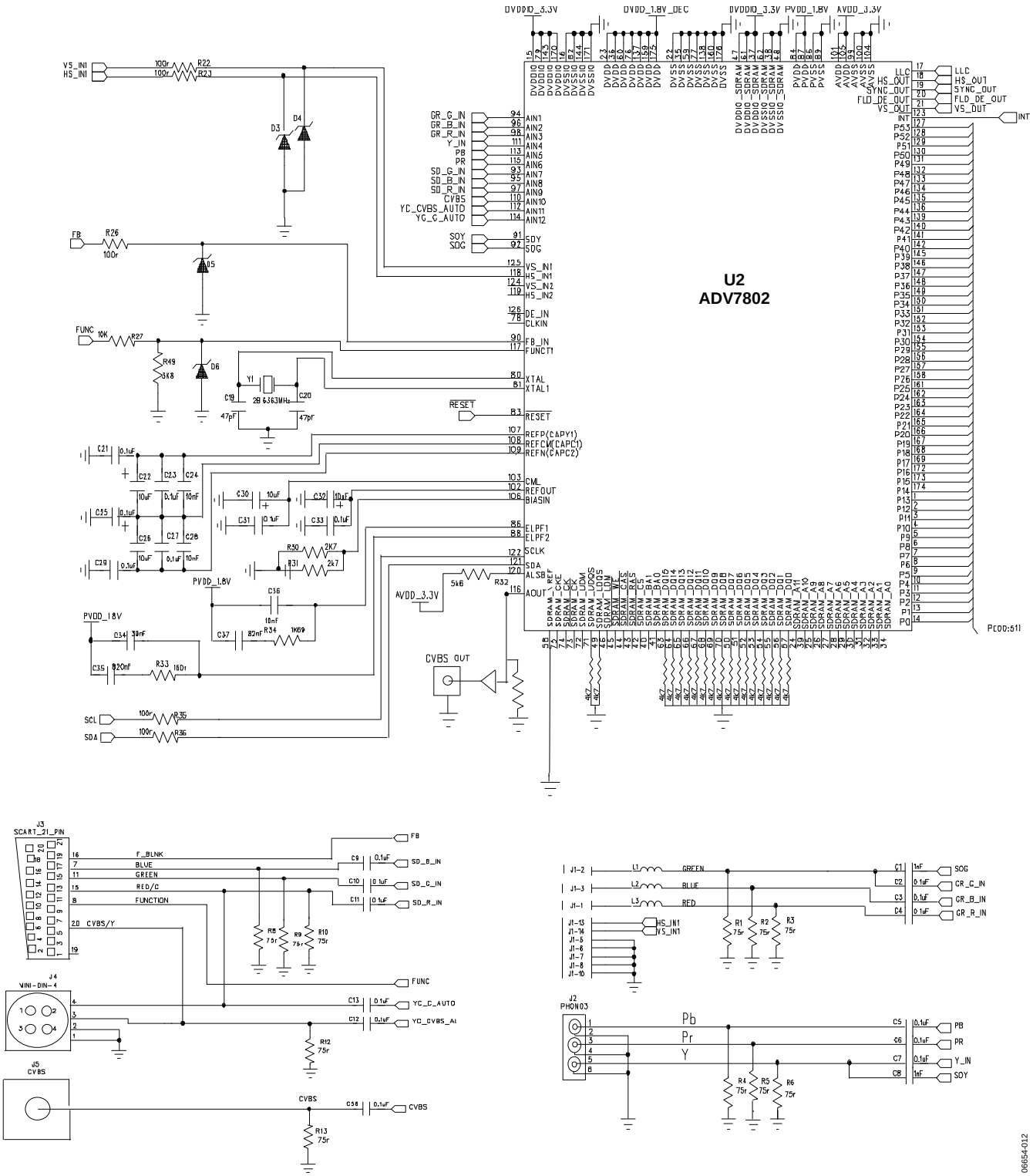


Figure 11. Typical Connection Diagram (No External Memory)

PIXEL INPUT/OUTPUT FORMATTING

There are several modes in which the ADV7802 pixel port can be configured. These modes are under the I²C control of OP_FORMAT_SEL[5:0].

PIXEL DATA OUTPUT MODES HIGHLIGHTS

The ADV7802 has a flexible pixel port, which can be configured in a variety of formats to accommodate downstream ICs. See Table 8 and Table 9 for more information on each mode. The output pixel port features include

- 8-/10-/12-bit ITU-R BT.656 4:2:2 YCrCb with embedded time codes and/or HS_OUT, VS_OUT, and FLD_DE_OUT pin timing
- 16-/20-/24-bit YCrCb with embedded time codes and/or HS_OUT, VS_OUT, and FLD_DE_OUT pin timing
- 24-/30-/36-/48-bit YCrCb/RGB with embedded time codes and/or HS_OUT, VS_OUT, and FLD_DE_OUT pin timing
- DDR 8-/10-/12-bit 4:2:2 YCrCb for all standards
- DDR 12-/24-/30-/36-bit 4:4:4 RGB for all standards
- 48-bit 4:4:4 RGB dual-pin mode
- Simultaneous output modes 16-/20-/24-bit YCrCb and 8-/10-/12-bit 4:2:2 YCrCb up to 525i/525p and 625i/625p

DIGITAL VIDEO INPUT PORT HIGHLIGHTS

The ADV7802 contains a 24-bit digital input port. The main features are as follows:

- Support for 24-bit RGB input data from the DVI/HDMI Rx IC, pass-through, or output converted to 4:2:2 YCrCb
- Support for 24-bit 4:4:4, 16-/20-bit 4:2:2 525i, 625i, 525p, 625p, 720p, 1080i, 1080p, and VGA to SXGA at 75 Hz input data from the DVI/HDMI Rx IC chip, pass-through, or output converted to 4:2:2 YCrCb
- Dedicated synchronization and pixel port inputs

Table 8. SDR Pixel Port Output Modes[1, 2]

OP_FORMAT_SEL [5:0]	0x00	0x01	0x02	0x03	0x04	0x05	0x06	0x07
Pixel Output	8-Bit SDR ITU-656 Mode 1	10-Bit SDR ITU-656 Mode 1	12-Bit SDR ITU-656 Mode 1	12-Bit SDR ITU-656 Mode 2	12-Bit SDR ITU-656 Mode 3	16-Bit SDR ITU-656 4:2:2 Mode 1	20-Bit SDR ITU-656 4:2:2 Mode 1	24-Bit SDR ITU-656 4:2:2 Mode 1
P53								
P52								
P51								
P50								
P49								
P48								
P47								
P46								
P45								
P44								
P43								
P42								
P41								
P40								
P39								
P38								
P37								
P36								
P35								
P34								
P33								
P32								
P31								
P30								
P29	Y7, Cb7, Cr7	Y9, Cb9, Cr9	Y11, Cb11, Cr11	Y11, Cb11, Cr11	Y11, Cb11, Cr11	Y7	Y9	Y11
P28	Y6, Cb6, Cr6	Y8, Cb8, Cr8	Y10, Cb10, Cr10	Y10, Cb10, Cr10	Y10, Cb10, Cr10	Y6	Y8	Y10
P27	Y5, Cb5, Cr5	Y7, Cb7, Cr7	Y9, Cb9, Cr9	Y9, Cb9, Cr9	Y9, Cb9, Cr9	Y5	Y7	Y9
P26	Y4, Cb4, Cr4	Y6, Cb6, Cr6	Y8, Cb8, Cr8	Y8, Cb8, Cr8	Y8, Cb8, Cr8	Y4	Y6	Y8
P25	Y3, Cb3, Cr3	Y5, Cb5, Cr5	Y7, Cb7, Cr7	Y7, Cb7, Cr7	Y7, Cb7, Cr7	Y3	Y5	Y7
P24	Y2, Cb2, Cr2	Y4, Cb4, Cr4	Y6, Cb6, Cr6	Y6, Cb6, Cr6	Y6, Cb6, Cr6	Y2	Y4	Y6
P23	Y1, Cb1, Cr1	Y3, Cb3, Cr3	Y5, Cb5, Cr5	Y5, Cb5, Cr5	Y5, Cb5, Cr5	Y1	Y3	Y5
P22	Y0, Cb0, Cr0	Y2, Cb2, Cr2	Y4, Cb4, Cr4	Y4, Cb4, Cr4	Y4, Cb4, Cr4	Y0	Y2	Y4
P21	Z	Y1, Cb1, Cr1	Y3, Cb3, Cr3	Z	Y3, Cb3, Cr3	Z	Y1	Y3
P20	Z	Y0, Cb0, Cr0	Y2, Cb2, Cr2	Z	Y2, Cb2, Cr2	Z	Y0	Y2
P19	Z	Z	Y1, Cb1, Cr1	Y3, Cb3, Cr3	Z	Cb7, Cr7	Cb9, Cr9	Cb11, Cr11
P18	Z	Z	Y0, Cb0, Cr0	Y2, Cb2, Cr2	Z	Cb6, Cr6	Cb8, Cr8	Cb10, Cr10
P17	Z	Z	Z	Y1, Cb1, Cr1	Z	Cb5, Cr5	Cb7, Cr7	Cb9, Cr9
P16	Z	Z	Z	Y0, Cb0, Cr0	Z	Cb4, Cr4	Cb6, Cr6	Cb8, Cr8
P15	Z	Z	Z	Z	Z	Cb3, Cr3	Cb5, Cr5	Cb7, Cr7
P14	Z	Z	Z	Z	Z	Cb2, Cr2	Cb4, Cr4	Cb6, Cr6
P13	Z	Z	Z	Z	Z	Cb1, Cr1	Cb3, Cr3	Cb5, Cr5
P12	Z	Z	Z	Z	Z	Cb0, Cr0	Cb2, Cr2	Cb4, Cr4
P11	Z	Z	Z	Z	Z	Z	Cb1, Cr1	Cb3, Cr3
P10	Z	Z	Z	Z	Z	Z	Cb0, Cr0	Cb2, Cr2

OP_FORMAT_SEL [5:0]	0x00	0x01	0x02	0x03	0x04	0x05	0x06	0x07
Pixel Output	8-Bit SDR ITU-656 Mode 1	10-Bit SDR ITU-656 Mode 1	12-Bit SDR ITU-656 Mode 1	12-Bit SDR ITU-656 Mode 2	12-Bit SDR ITU-656 Mode 3	16-Bit SDR ITU-656 4:2:2 Mode 1	20-Bit SDR ITU-656 4:2:2 Mode 1	24-Bit SDR ITU-656 4:2:2 Mode 1
P9	Z	Z	Z	Z	Z	Z	Z	Y1
P8	Z	Z	Z	Z	Z	Z	Z	Y0
P7	Z	Z	Z	Z	Z	Z	Z	Z
P6	Z	Z	Z	Z	Z	Z	Z	Z
P5	Z	Z	Z	Z	Z	Z	Z	Cb1, Cr1
P4	Z	Z	Z	Z	Z	Z	Z	Cb0, Cr0
P3	Z	Z	Z	Z	Y1, Cb1, Cr1	Z	Z	Z
P2	Z	Z	Z	Z	Y0, Cb0, Cr0	Z	Z	Z
P1	Z	Z	Z	Z	Z	Z	Z	Z
P0	Z	Z	Z	Z	Z	Z	Z	Z

[1] It is recommended to print this table (located on this page and the following two pages) and read as one horizontal expanded table.
[2] Blank cells are not populated areas.

OP_FORMAT_SEL [5:0]	0x08	0x09	0x0A	0x2C	0x2D	0x2E	0x0B	0x0C	0x0D
Pixel Output	24-Bit SDR ITU-656 4:2:2 Mode 2	24-Bit SDR ITU-656 4:2:2 Mode 3	24-Bit SDR 4:4:4 Mode 1	24-Bit SDR 4:4:4 Mode 2	24-Bit SDR 4:4:4 Mode 3	24-Bit SDR 4:4:4 Mode 1	30-Bit SDR 4:4:4 Mode 1	36-Bit SDR 4:4:4 Mode 1	36-Bit SDR 4:4:4 Mode 2
P53								G1	G3
P52								G0	G2
P51								Z	G1
P50								Z	G0
P49								Z	Z
P48								Z	Z
P47								Z	Z
P46								Z	Z
P45								B1	B3
P44								B0	B2
P43								Z	B1
P42								Z	B0
P41								Z	Z
P40								Z	Z
P39								Z	Z
P38								Z	Z
P37								R1	R3
P36								R0	R2
P35								Z	R1
P34								Z	R0
P33								Z	Z
P32								Z	Z
P31								Z	Z
P30								Z	Z
P29	Y11	Y11	G7	G7	R7	B7	G9	G11	G11
P28	Y10	Y10	G6	G6	R6	B6	G8	G10	G10
P27	Y9	Y9	G5	G5	R5	B5	G7	G9	G9
P26	Y8	Y8	G4	G4	R4	B4	G6	G8	G8
P25	Y7	Y7	G3	G3	R3	B3	G5	G7	G7
P24	Y6	Y6	G2	G2	R2	B2	G4	G6	G6
P23	Y5	Y5	G1	G1	R1	B1	G3	G5	G5
P22	Y4	Y4	G0	G0	R0	B0	G2	G4	G4
P21	Y3	Z	Z	B7	G7	R7	G1	G3	Z
P20	Y2	Z	Z	B6	G6	R6	G0	G2	Z
P19	Cb11, Cr11	Cb11, Cr11	B7	B5	G5	R5	B9	B11	B11
P18	Cb10, Cr10	Cb10, Cr10	B6	B4	G4	R4	B8	B10	B10
P17	Cb9, Cr9	Cb9, Cr9	B5	B3	G3	R3	B7	B9	B9
P16	Cb8, Cr8	Cb8, Cr8	B4	B2	G2	R2	B6	B8	B8
P15	Cb7, Cr7	Cb7, Cr7	B3	B1	G1	R1	B5	B7	B7
P14	Cb6, Cr6	Cb6, Cr6	B2	B0	G0	R0	B4	B6	B6
P13	Cb5, Cr5	Cb5, Cr5	B1	R7	B7	G7	B3	B5	B5
P12	Cb4, Cr4	Cb4, Cr4	B0	R6	B6	G6	B2	B4	B4
P11	Cb3, Cr3	Z	Z	R5	B5	G5	B1	B3	Z
P10	Cb2, Cr2	Z	Z	R4	B4	G4	B0	B2	Z

OP_FORMAT_SEL [5:0]	0x08	0x09	0x0A	0x2C	0x2D	0x2E	0x0B	0x0C	0x0D
Pixel Output	24-Bit SDR ITU-656 4:2:2 Mode 2	24-Bit SDR ITU-656 4:2:2 Mode 3	24-Bit SDR 4:4:4 Mode 1	24-Bit SDR 4:4:4 Mode 2	24-Bit SDR 4:4:4 Mode 3	24-Bit SDR 4:4:4 Mode 1	30-Bit SDR 4:4:4 Mode 1	36-Bit SDR 4:4:4 Mode 1	36-Bit SDR 4:4:4 Mode 2
P9	Z	Y3	R7	R3	B3	G3	R9	R11	R11
P8	Z	Y3	R6	R2	B2	G2	R8	R10	R10
P7	Cb1, Cr1	Y1	R5	R1	B1	G1	R7	R9	R9
P6	Cb0, Cr0	Y0	R4	R0	B0	G0	R6	R8	R8
P5	Z	Cb3, Cr3	R3	Z	Z	Z	R5	R7	R7
P4	Z	Cb2, Cr2	R2	Z	Z	Z	R4	R6	R6
P3	Y1	Cb1, Cr1	R1	Z	Z	Z	R3	R5	R5
P2	Y0	Cb0, Cr0	R0	Z	Z	Z	R2	R4	R4
P1	Z	Z	Z	Z	Z	Z	R1	R3	Z
P0	Z	Z	Z	Z	Z	Z	R0	R2	Z

OP_FORMAT_SEL [5:0]	0x28	0x29	0x2A	0x2B	0x0E	0x0F	
Pixel Output	16-Bit and 8-Bit SDR 4:2:2 Mode 1 Parallel Output	20-Bit and 10-Bit SDR 4:2:2 Mode 1 Parallel Output	24-Bit and 12-Bit SDR 4:2:2 Mode 1 Parallel Output	24-Bit and 12-Bit SDR 4:2:2 Mode 2 Parallel Output	48-Bit Dual Pin Mode 0	48-Bit Dual Pin Mode 1	
					Clock Rise	Clock Rise	Clock Fall
P53			Main Y1	Main Y3	G7-1		G7-1
P52			Main Y0	Main Y2	G6-1		G6-1
P51			Z	Main Y1	G5-1		G5-1
P50			Z	Main Y0	G4-1		G4-1
P49			Z	Z	G3-1		G3-1
P48			Z	Z	G2-1		G2-1
P47			Z	Z	G1-1		G1-1
P46			Z	Z	G0-1		G0-1
P45			Main Cb1, Cr1	Main Cb3, Cr3	B7-1		B7-1
P44			Main Cb0, Cr0	Main Cb2, Cr2	B6-1		B6-1
P43			Z	Main Cb1, Cr1	B5-1		B5-1
P42			Z	Main Cb0, Cr0	B4-1		B4-1
P41			Z	Z	B3-1		B3-1
P40			Z	Z	B2-1		B2-1
P39			Z	Z	B1-1		B1-1
P38			Z	Z	B0-1		B0-1
P37			Aux Y1, Cb1, Cr1	Aux Y3, Cb3, Cr3	R7-1		R7-1
P36			Aux Y0, Cb0, Cr0	Aux Y2, Cb2, Cr2	R6-1		R6-1
P35			Z	Aux Y1, Cb1, Cr1	R5-1		R5-1
P34			Z	Aux Y0, Cb0, Cr0	R4-1		R4-1
P33			Z	Z	R3-1		R3-1
P32			Z	Z	R2-1		R2-1
P31			Z	Z	R1-1		R1-1
P30			Z	Z	R0-1		R0-1
P29	Main Y7	Main Y9	Main Y11	Main Y11	G7-0	G7-0	
P28	Main Y6	Main Y8	Main Y10	Main Y10	G6-0	G6-0	
P27	Main Y5	Main Y7	Main Y9	Main Y9	G5-0	G5-0	
P26	Main Y4	Main Y6	Main Y8	Main Y8	G4-0	G4-0	
P25	Main Y3	Main Y5	Main Y7	Main Y7	G3-0	G3-0	
P24	Main Y2	Main Y4	Main Y6	Main Y6	G2-0	G2-0	
P23	Main Y1	Main Y3	Main Y5	Main Y5	G1-0	G1-0	
P22	Main Y0	Main Y2	Main Y4	Main Y4	G0-0	G0-0	
P21	Z	Main Y1	Main Y3	Z	Z	Z	
P20	Z	Main Y0	Main Y2	Z	Z	Z	
P19	Main Cb7, Cr7	Main Cb9, Cr9	Main Cb11, Cr11	Main Cb11, Cr11	B7-0	B7-0	
P18	Main Cb6, Cr6	Main Cb8, Cr8	Main Cb10, Cr10	Main Cb10, Cr10	B6-0	B6-0	
P17	Main Cb5, Cr5	Main Cb7, Cr7	Main Cb9, Cr9	Main Cb9, Cr9	B5-0	B5-0	
P16	Main Cb4, Cr4	Main Cb6, Cr6	Main Cb8, Cr8	Main Cb8, Cr8	B4-0	B4-0	
P15	Main Cb3, Cr3	Main Cb5, Cr5	Main Cb7, Cr7	Main Cb7, Cr7	B3-0	B3-0	
P14	Main Cb2, Cr2	Main Cb4, Cr4	Main Cb6, Cr6	Main Cb6, Cr6	B2-0	B2-0	
P13	Main Cb1, Cr1	Main Cb3, Cr3	Main Cb5, Cr5	Main Cb5, Cr5	B1-0	B1-0	
P12	Main Cb0, Cr0	Main Cb2, Cr2	Main Cb4, Cr4	Main Cb4, Cr4	B0-0	B0-0	
P11	Z	Main Cb1, Cr1	Main Cb3, Cr3	Z	Z	Z	
P10	Z	Main Cb0, Cr0	Main Cb2, Cr2	Z	Z	Z	

OP_FORMAT_SEL [5:0]	0x28	0x29	0x2A	0x2B	0x0E	0x0F	
Pixel Output	16-Bit and 8-Bit SDR 4:2:2 Mode 1 Parallel Output	20-Bit and 10-Bit SDR 4:2:2 Mode 1 Parallel Output	24-Bit and 12-Bit SDR 4:2:2 Mode 1 Parallel Output	24-Bit and 12-Bit SDR 4:2:2 Mode 2 Parallel Output	48-Bit Dual Pin Mode 0	48-Bit Dual Pin Mode 1	
P9	Aux Y7, Cb7, Cr7	Aux Y9, Cb9, Cr9	Aux Y11, Cb11, Cr11	Aux Y11, Cb11, Cr11	R7-0	R7-0	
P8	Aux Y6, Cb6, Cr6	Aux Y8, Cb8, Cr8	Aux Y10, Cb10, Cr10	Aux Y10, Cb10, Cr10	R6-0	R6-0	
P7	Aux Y5, Cb5, Cr5	Aux Y7, Cb7, Cr7	Aux Y9, Cb9, Cr9	Aux Y9, Cb9, Cr9	R5-0	R5-0	
P6	Aux Y4, Cb4, Cr4	Aux Y6, Cb6, Cr6	Aux Y8, Cb8, Cr8	Aux Y8, Cb8, Cr8	R4-0	R4-0	
P5	Aux Y3, Cb3, Cr3	Aux Y5, Cb5, Cr5	Aux Y7, Cb7, Cr7	Aux Y7, Cb7, Cr7	R3-0	R3-0	
P4	Aux Y2, Cb2, Cr2	Aux Y4, Cb4, Cr4	Aux Y6, Cb6, Cr6	Aux Y6, Cb6, Cr6	R2-0	R2-0	
P3	Aux Y1, Cb1, Cr1	Aux Y3, Cb3, Cr3	Aux Y5, Cb5, Cr5	Aux Y5, Cb5, Cr5	R1-0	R1-0	
P2	Aux Y0, Cb0, Cr0	Aux Y2, Cb2, Cr2	Aux Y4, Cb4, Cr4	Aux Y4, Cb4, Cr4	R0-0	R0-0	
P1	Z	Aux Y1, Cb1, Cr1	Aux Y3, Cb3, Cr3	Z	Z	Z	
P0	Z	Aux Y0, Cb0, Cr0	Aux Y2, Cb2, Cr2	Z	Z	Z	

Table 9. DDR Pixel Port Output Modes[1, 2]

OP_FORMAT_SEL [5:0]	0x10		0x11		0x12		0x13		0x14	
	8-Bit DDR ITU-656		10-Bit DDR ITU-656		12-Bit DDR YCrCb 4:2:2 Mode 1		12-Bit DDR YCrCb 4:2:2 Mode 2		12-Bit DDR YCrCb 4:2:2 Mode 3	
Pixel Output	**Clock Rise**	**Clock Fall**	**Clock Rise**	**Clock Fall**	**Clock Rise**	**Clock Fall**	**Clock Rise**	**Clock Fall**	**Clock Rise**	**Clock Fall**
P53										
P52										
P51										
P50										
P49										
P48										
P47										
P46										
P45										
P44										
P43										
P42										
P41										
P40										
P39										
P38										
P37										
P36										
P35										
P34										
P33										
P32										
P31										
P30										
P29	Cb7, Cr7	Y7	Cb9, Cr9	Y9	Cb11, Cr11	Y11	Cb11, Cr11	Y11	Cb11, Cr11	Y11
P28	Cb6, Cr6	Y6	Cb8, Cr8	Y8	Cb10, Cr10	Y10	Cb10, Cr10	Y10	Cb10, Cr10	Y10
P27	Cb5, Cr5	Y5	Cb7, Cr7	Y7	Cb9, Cr9	Y9	Cb9, Cr9	Y9	Cb9, Cr9	Y9
P26	Cb4, Cr4	Y4	Cb6, Cr6	Y6	Cb8, Cr8	Y8	Cb8, Cr8	Y8	Cb8, Cr8	Y8
P25	Cb3, Cr3	Y3	Cb5, Cr5	Y5	Cb7, Cr7	Y7	Cb7, Cr7	Y7	Cb7, Cr7	Y7
P24	Cb2, Cr2	Y2	Cb4, Cr4	Y4	Cb6, Cr6	Y6	Cb6, Cr6	Y6	Cb6, Cr6	Y6
P23	Cb1, Cr1	Y1	Cb3, Cr3	Y3	Cb5, Cr5	Y5	Cb5, Cr5	Y5	Cb5, Cr5	Y5
P22	Cb0, Cr0	Y0	Cb2, Cr2	Y2	Cb4, Cr4	Y4	Cb4, Cr4	Y4	Cb4, Cr4	Y4
P21	Z	Z	Cb1, Cr1	Y1	Cb3, Cr3	Y3	Z	Z	Cb3, Cr3	Y3
P20	Z	Z	Cb0, Cr0	Y0	Cb2, Cr2	Y2	Z	Z	Cb2, Cr2	Y2
P19	Z	Z	Z	Z	Cb1, Cr1	Y1	Cb3, Cr3	Y3	Z	Z
P18	Z	Z	Z	Z	Cb0, Cr0	Y0	Cb2, Cr2	Y2	Z	Z
P17	Z	Z	Z	Z	Z	Z	Cb1, Cr1	Y1	Z	Z
P16	Z	Z	Z	Z	Z	Z	Cb0, Cr0	Y0	Z	Z
P15	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z
P14	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z
P13	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z
P12	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z
P11	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z
P10	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z

OP_FORMAT_SEL [5:0]	0x10		0x11		0x12		0x13		0x14	
	8-Bit DDR ITU-656		10-Bit DDR ITU-656		12-Bit DDR YCrCb 4:2:2 Mode 1		12-Bit DDR YCrCb 4:2:2 Mode 2		12-Bit DDR YCrCb 4:2:2 Mode 3	
Pixel Output	**Clock Rise**	**Clock Fall**	**Clock Rise**	**Clock Fall**	**Clock Rise**	**Clock Fall**	**Clock Rise**	**Clock Fall**	**Clock Rise**	**Clock Fall**
P9	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z
P8	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z
P7	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z
P6	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z
P5	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z
P4	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z
P3	Z	Z	Z	Z	Z	Z	Z	Z	Cb1, Cr1	Y1
P2	Z	Z	Z	Z	Z	Z	Z	Z	Cb0, Cr0	Y0
P1	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z
P0	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z

[1] It is recommended to print this table (located on this page and the following three pages) and read as one horizontal expanded table.
[2] Blank cells are not populated areas.

OP_FORMAT_SEL [5:0]	0x15		0x1A		0x1B		0x1C	
	12-Bit DDR RGB 4:4:4		24-Bit DDR RGB (CLK/2)		30-Bit DDR RGB (CLK/2)		36-Bit DDR RGB (CLK/2) Mode 1	
Pixel Output	Clock Rise	Clock Fall	Clock Rise	Clock Fall	Clock Rise	Clock Fall	Clock Rise	Clock Fall
P53							G1-0	G1-1
P52							G0-0	G0-1
P51							Z	Z
P50							Z	Z
P49							Z	Z
P48							Z	Z
P47							Z	Z
P46							Z	Z
P45							B1-0	B1-1
P44							B0-0	B0-1
P43							Z	Z
P42							Z	Z
P41							Z	Z
P40							Z	Z
P39							Z	Z
P38							Z	Z
P37							R1-0	R1-1
P36							R0-0	R0-1
P35							Z	Z
P34							Z	Z
P33							Z	Z
P32							Z	Z
P31							Z	Z
P30							Z	Z
P29	B7	R3	G7-0	G7-1	G9-0	G9-1	G11-0	G11-1
P28	B6	R2	G6-0	G6-1	G8-0	G8-1	G10-0	G10-1
P27	B5	R1	G5-0	G5-1	G7-0	G7-1	G9-0	G9-1
P26	B4	R0	G4-0	G4-1	G6-0	G6-1	G8-0	G8-1
P25	B3	G7	G3-0	G3-1	G5-0	G5-1	G7-0	G7-1
P24	B2	G6	G2-0	G2-1	G4-0	G4-1	G6-0	G6-1
P23	B1	G5	G1-0	G1-1	G3-0	G3-1	G5-0	G5-1
P22	B0	G4	G0-0	G0-1	G2-0	G2-1	G4-0	G4-1
P21	Z	Z	Z	Z	G1-0	G1-1	G3-0	G3-1
P20	Z	Z	Z	Z	G0-0	G0-1	G2-0	G2-1
P19	G3	R7	B7-0	B7-1	B9-0	B9-1	B11-0	B11-1
P18	G2	R6	B6-0	B6-1	B8-0	B8-1	B10-0	B10-1
P17	G1	R5	B5-0	B5-1	B7-0	B7-1	B9-0	B9-1
P16	G0	R4	B4-0	B4-1	B6-0	B6-1	B8-0	B8-1
P15	Z	Z	B3-0	B3-1	B5-0	B5-1	B7-0	B7-1
P14	Z	Z	B2-0	B2-1	B4-0	B4-1	B6-0	B6-1
P13	Z	Z	B1-0	B1-1	B3-0	B3-1	B5-0	B5-1
P12	Z	Z	B0-0	B0-1	B2-0	B2-1	B4-0	B4-1
P11	Z	Z	Z	Z	B1-0	B1-1	B3-0	B3-0
P10	Z	Z	Z	Z	B0-0	B0-1	B2-0	B2-1
P9	Z	Z	R7-0	R7-1	R9-0	R9-1	R11-0	R11-1
P8	Z	Z	R6-0	R6-1	R8-0	R8-1	R10-0	R10-1
P7	Z	Z	R5-0	R5-1	R7-0	R7-1	R9-0	R9-1
P6	Z	Z	R4-0	R4-1	R6-0	R6-1	R8-0	R8-1
P5	Z	Z	R3-0	R3-1	R5-0	R5-1	R7-0	R7-1
P4	Z	Z	R2-0	R2-1	R4-0	R4-1	R6-0	R6-1
P3	Z	Z	R1-0	R1-1	R3-0	R3-1	R5-0	R5-1
P2	Z	Z	R0-0	R0-1	R2-0	R2-1	R4-0	R4-1
P1	Z	Z	Z	Z	R1-0	R1-1	R3-0	R3-1
P0	Z	Z	Z	Z	R0-0	R0-1	R2-0	R2-1

OP_FORMAT_SEL [5:0]	0x1D		0x38		0x39		0x3A	
	36-Bit DDR RGB (CLK/2) Mode 2		16-Bit and 8-Bit DDR 4:2:2 Mode 1 Parallel Output (CLK/2)		20-Bit and 10-Bit DDR 4:2:2 Mode 1 Parallel Output (CLK/2)		24-Bit and 12-Bit DDR 4:2:2 Mode 1 Parallel Output (CLK/2)	
Pixel Output	**Clock Rise**	**Clock Fall**	**Clock Rise**	**Clock Fall**	**Clock Rise**	**Clock Fall**	**Clock Rise**	**Clock Fall**
P53	G3-0	G3-1					Main Y1	Main Y1
P52	G2-0	G2-1					Main Y0	Main Y0
P51	G1-0	G1-1					Z	Z
P50	G0-0	G0-1					Z	Z
P49	Z	Z					Z	Z
P48	Z	Z					Z	Z
P47	Z	Z					Z	Z
P46	Z	Z					Z	Z
P45	B3-0	B3-1					Main Cb1	Main Cr1
P44	B2-0	B2-1					Main Cb0	Main Cr0
P43	B1-0	B1-1					Z	Z
P42	B0-0	B0-1					Z	Z
P41	Z	Z					Z	Z
P40	Z	Z					Z	Z
P39	Z	Z					Z	Z
P38	Z	Z					Z	Z
P37	R3-0	R3-1					Aux Cb1, Cr1	Aux Cr0
P36	R2-0	R2-1					Aux Cb0, Cr0	Aux Cr0
P35	R1-0	R1-1					Z	Z
P34	R0-0	R0-1					Z	Z
P33	Z	Z					Z	Z
P32	Z	Z					Z	Z
P31	Z	Z					Z	Z
P30	Z	Z					Z	Z
P29	G11-0	G11-1	Main Y7	Main Y7	Main Y9	Main Y9	Main Y11	Main Y11
P28	G10-0	G10-1	Main Y6	Main Y6	Main Y8	Main Y8	Main Y10	Main Y10
P27	G9-0	G9-1	Main Y5	Main Y5	Main Y7	Main Y7	Main Y9	Main Y9
P26	G8-0	G8-1	Main Y4	Main Y4	Main Y6	Main Y6	Main Y8	Main Y8
P25	G7-0	G7-1	Main Y3	Main Y3	Main Y5	Main Y5	Main Y7	Main Y7
P24	G6-0	G6-1	Main Y2	Main Y2	Main Y4	Main Y4	Main Y6	Main Y6
P23	G5-0	G5-1	Main Y1	Main Y1	Main Y3	Main Y3	Main Y5	Main Y5
P22	G4-0	G4-1	Main Y0	Main Y0	Main Y2	Main Y2	Main Y4	Main Y4
P21	Z	Z	Z	Z	Main Y1	Main Y1	Main Y3	Main Y3
P20	Z	Z	Z	Z	Main Y0	Main Y0	Main Y2	Main Y2
P19	B11-0	B11-1	Main Cb7	Main Cr7	Main Cb9	Main Cr9	Main Cb11	Main Cr11
P18	B10-0	B10-1	Main Cb6	Main Cr6	Main Cb8	Main Cr8	Main Cb10	Main Cr10
P17	B9-0	B9-1	Main Cb5	Main Cr5	Main Cb7	Main Cr7	Main Cb9	Main Cr9
P16	B8-0	B8-1	Main Cb4	Main Cr4	Main Cb6	Main Cr6	Main Cb8	Main Cr8
P15	B7-0	B7-1	Main Cb3	Main Cr3	Main Cb5	Main Cr5	Main Cb7	Main Cr7
P14	B6-0	B6-1	Main Cb2	Main Cr2	Main Cb4	Main Cr4	Main Cb6	Main Cr6
P13	B5-0	B5-1	Main Cb1	Main Cr1	Main Cb3	Main Cr3	Main Cb5	Main Cr5
P12	B4-0	B4-1	Main Cb0	Main Cr0	Main Cb2	Main Cr2	Main Cb4	Main Cr4
P11	Z	Z	Z	Z	Main Cb1	Main Cr1	Main Cb3	Main Cr3
P10	Z	Z	Z	Z	Main Cb0	Main Cr0	Main Cb2	Main Cr2
P9	R11-0	R11-1	Aux Cb7, Cr7	Aux Y7	Aux Cb9, Cr9	Aux Y9	Aux Cb11, Cr11	Aux Y11
P8	R10-0	R10-1	Aux Cb6, Cr6	Aux Y6	Aux Cb8, Cr8	Aux Y8	Aux Cb10, Cr10	Aux Y10
P7	R9-0	R9-1	Aux Cb5, Cr5	Aux Y5	Aux Cb7, Cr7	Aux Y7	Aux Cb9, Cr9	Aux Y9
P6	R8-0	R8-1	Aux Cb4, Cr4	Aux Y4	Aux Cb6, Cr6	Aux Y6	Aux Cb8, Cr8	Aux Y8
P5	R7-0	R7-1	Aux Cb3, Cr3	Aux Y3	Aux Cb5, Cr5	Aux Y5	Aux Cb7, Cr7	Aux Y7
P4	R6-0	R6-1	Aux Cb2, Cr2	Aux Y2	Aux Cb4, Cr4	Aux Y4	Aux Cb6, Cr6	Aux Y6
P3	R5-0	R5-1	Aux Cb1, Cr1	Aux Y1	Aux Cb3, Cr3	Aux Y3	Aux Cb5, Cr5	Aux Y5
P2	R4-0	R4-1	Aux Cb0, Cr0	Aux Y0	Aux Cb2, Cr2	Aux Y2	Aux Cb4, Cr4	Aux Y4
P1	Z	Z	Z	Z	Aux Cb1, Cr1	Aux Y1	Aux Cb3, Cr3	Aux Y3
P0	Z	Z	Z	Z	Aux Cb0, Cr0	Aux Y0	Aux Cb2, Cr2	Aux Y2

OP_FORMAT_SEL [5:0]	0x3B		0x3C		0x3D		0x3E	
	24-Bit and 12-Bit DDR 4:2:2 Mode 2 Parallel Output (CLK/2)		24-Bit DDR 4:2:2 RGB (CLK/2)		24-Bit DDR 4:2:2 RGB (CLK/2) Mode 1		24-Bit DDR 4:2:2 RGB (CLK/2) Mode 2	
Pixel Output	Clock Rise	Clock Fall	Clock Rise	Clock Fall	Clock Rise	Clock Fall	Clock Rise	Clock Fall
P53	Main Y3	Main Y3						
P52	Main Y2	Main Y2						
P51	Main Y1	Main Y1						
P50	Main Y0	Main Y0						
P49	Z	Z						
P48	Z	Z						
P47	Z	Z						
P46	Z	Z						
P45	Main Cb3	Main Cr3						
P44	Main Cb2	Main Cr2						
P43	Main Cb1	Main Cr1						
P42	Main Cb0	Main Cr0						
P41	Z	Z						
P40	Z	Z						
P39	Z	Z						
P38	Z	Z						
P37	Aux Cb3, Cr3	Aux Y3						
P36	Aux Cb2, Cr2	Aux Y2						
P35	Aux Cb1, Cr1	Aux Y1						
P34	Aux Cb0, Cr0	Aux Y0						
P33	Z	Z						
P32	Z	Z						
P31	Z	Z						
P30	Z	Z						
P29	Main Y11	Main Y11	G7-0	G7-1	R7-0	R7-1	B7-0	B7-1
P28	Main Y10	Main Y10	G6-0	G6-1	R6-0	R6-1	B6-0	B6-1
P27	Main Y9	Main Y9	G5-0	G5-1	R5-0	R5-1	B5-0	B5-1
P26	Main Y8	Main Y8	G4-0	G4-1	R4-0	R4-1	B4-0	B4-1
P25	Main Y7	Main Y7	G3-0	G3-1	R3-0	R3-1	B3-0	B3-1
P24	Main Y6	Main Y6	G2-0	G2-1	R2-0	R2-1	B2-0	B2-1
P23	Main Y5	Main Y5	G1-0	G1-1	R1-0	R1-1	B1-0	B1-1
P22	Main Y4	Main Y4	G0-0	G0-1	R0-0	R0-1	B0-0	B0-1
P21	Z	Z	B7-0	B7-1	G7-0	G7-1	R7-0	R7-1
P20	Z	Z	B6-0	B6-1	G6-0	G6-1	R6-0	R6-1
P19	Main Cb11	Main Cr11	B5-0	B5-1	G5-0	G5-1	R5-0	R5-1
P18	Main Cb10	Main Cr10	B4-0	B4-1	G4-0	G4-1	R4-0	R4-1
P17	Main Cb9	Main Cr9	B3-0	B3-1	G3-0	G3-1	R3-0	R3-1
P16	Main Cb8	Main Cr8	B2-0	B2-1	G2-0	G2-1	R2-0	R2-1
P15	Main Cb7	Main Cr7	B1-0	B1-1	G1-0	G1-1	R1-0	R1-1
P14	Main Cb6	Main Cr6	B0-0	B0-1	G0-0	G0-1	R7-0	R7-1
P13	Main Cb5	Main Cr5	R7-0	R7-1	B7-0	B7-1	G7-0	G7-1
P12	Main Cb4	Main Cr4	R6-0	R6-1	B6-0	B6-1	G6-0	G6-1
P11	Z	Z	R5-0	R5-1	B5-0	B5-1	G5-0	G5-1
P10	Z	Z	R4-0	R4-1	B4-0	B4-1	G4-0	G4-1
P9	Aux Cb11, Cr11	Aux Y11	R3-0	R3-1	B3-0	B3-1	G3-0	G3-1
P8	Aux Cb10, Cr10	Aux Y10	R2-0	R2-1	B2-0	B2-1	G2-0	G2-1
P7	Aux Cb9, Cr9	Aux Y9	R1-0	R1-1	B1-0	B1-1	G1-0	G1-1
P6	Aux Cb8, Cr8	Aux Y8	R0-0	R0-1	B0-0	B0-1	G0-0	G0-1
P5	Aux Cb7, Cr7	Aux Y7	Z	Z	Z	Z	Z	Z
P4	Aux Cb6, Cr6	Aux Y6	Z	Z	Z	Z	Z	Z
P3	Aux Cb5, Cr5	Aux Y5	Z	Z	Z	Z	Z	Z
P2	Aux Cb4, Cr4	Aux Y4	Z	Z	Z	Z	Z	Z
P1	Z	Z	Z	Z	Z	Z	Z	Z
P0	Z	Z	Z	Z	Z	Z	Z	Z

Table 10. Pixel Port Input Modes

IP_DATA_SEL[5:0]	0x00	0x01	0x04	0x06	0x07
Pixel Input	**24-Bit 4:4:4 Input**	**20-Bit 4:2:2 Input**	**16-Bit 4:2:2 Input**	**10-Bit 4:2:2 Input**	**8-Bit 4:2:2 Input**
P53	G7	Y9	Y7	Y9, Cb9, Cr9	Y7, Cb7, Cr7
P52	G6	Y8	Y6	Y8, Cb8, Cr8	Y6, Cb6, Cr6
P51	G5	Y7	Y5	Y7, Cb7, Cr7	Y5,Cb5, Cr5
P50	G4	Y6	Y4	Y6, Cb6, Cr6	Y4, Cb4, Cr4
P49	G3	Y5	Y3	Y5,Cb5, Cr5	Y3, Cb3, Cr3
P48	G2	Y4	Y2	Y4, Cb4, Cr4	Y2, Cb2, Cr2
P47	G1	Y3	Y1	Y3, Cb3, Cr3	Y1, Cb1, Cr1
P46	G0	Y2	Y0	Y2, Cb2, Cr2	Y0, Cb0, Cr0
P45	B7	Cb9, Cr9	Cb7, Cr7	Y1, Cb1, Cr1	Z
P44	B6	Cb8, Cr8	Cb6, Cr6	Y0, Cb0, Cr0	Z
P43	B5	Cb7, Cr7	Cb5, Cr5	Z	Z
P42	B4	Cb6, Cr6	Cb4, Cr4	Z	Z
P41	B3	Cb5, Cr5	Cb3, Cr3	Z	Z
P40	B2	Cb4, Cr4	Cb2, Cr2	Z	Z
P39	B1	Cb3, Cr3	Cb1, Cr1	Z	Z
P38	B0	Cb2, Cr2	Cb0, Cr0	Z	Z
P37	R7	Y1	Z	Z	Z
P36	R6	Y0	Z	Z	Z
P35	R5	Z	Z	Z	Z
P34	R4	Z	Z	Z	Z
P33	R3	Cb1, Cr1	Z	Z	Z
P32	R2	Cb0, Cr0	Z	Z	Z
P31	R1	Z	Z	Z	Z
P30	R0	Z	Z	Z	Z

OUTLINE DIMENSIONS

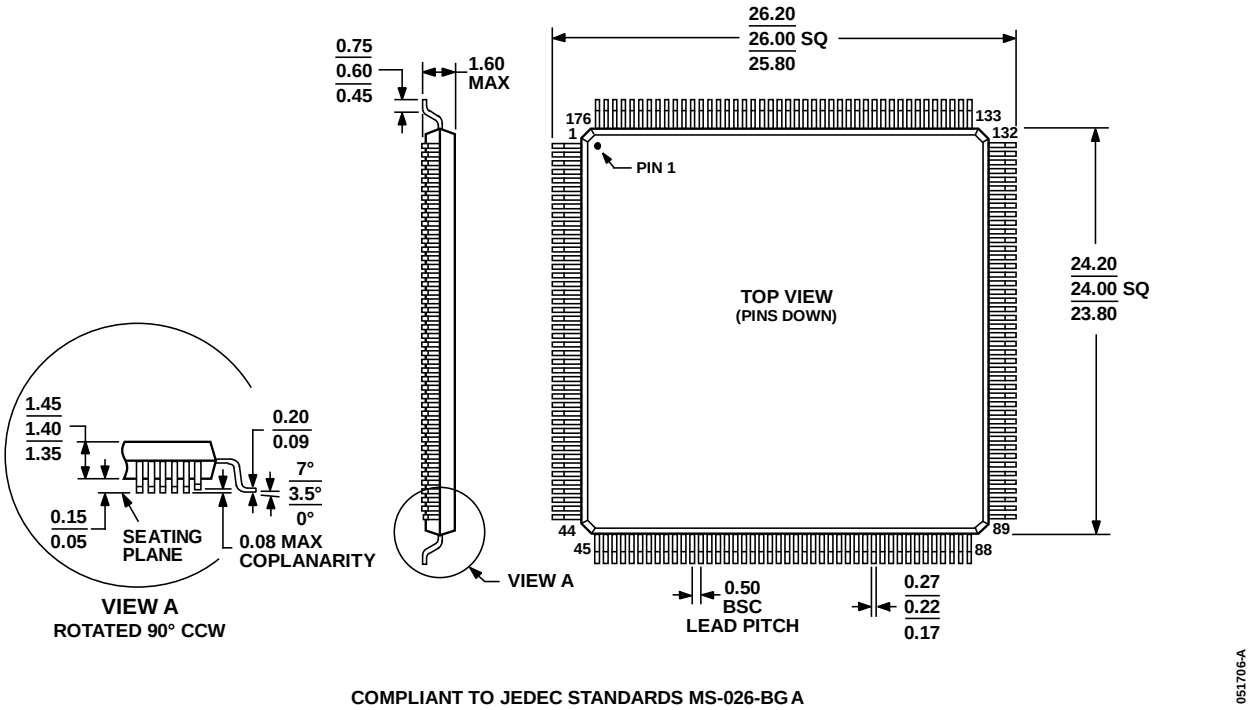


Figure 12. 176-Lead Low Profile Quad Flat Package [LQFP]
(ST-176)
Dimensions shown in millimeters

ORDERING GUIDE

Model[1]	Temperature Range	Package Description	Package Option
ADV7802BSTZ-80	0°C to +85°C	176-Lead Low Profile Quad Flat Package [LQFP]	ST-176
ADV7802BSTZ-150	0°C to +85°C	176-Lead Low Profile Quad Flat Package [LQFP]	ST-176
EVAL-ADV7802EB1Z		Evaluation Board (with External DDR SD Memory)	

[1] Z = RoHS Compliant Part.

NOTES

NOTES

I²C refers to a communications protocol originally developed by Philips Semiconductors (now NXP Semiconductors).

©2011 Analog Devices, Inc. All rights reserved. Trademarks and registered trademarks are the property of their respective owners.
D06654-0-8/11(D)