FMS6414
Dual Channel Video Drivers with Integrated Filters

Video Features

- Dual Integrated Video Low Pass reconstruction filters on outputs
- Integrated output drivers provide low impedance outputs and deliver 2Vp-p (6dB gain) composite video into 150Ω.
- 7.1MHz 4th order video filters
- 0.4% differential gain with 0.4° differential phase
- Integrated DC Restore / Clamp Circuitry

Applications

- CCTV
- Cable and Satellite Set top boxes
- DVD players
- Televisions
- HDTV
- Personal Video Recorders (PVRs)
- Video On Demand (VOD)

General Description

The FMS6414 Dual Channel Video Filter – Driver Chip offers comprehensive video filtering for set top box or DVD applications. This part consists of two 4th order video Low Pass Filters for video filtering. This device integrates video drivers so that it can directly drive to the outside world.

The video signals are filtered at 7.1MHz and buffered to drive 2Vp-p into AC coupled 150Ω loads with up to 35pF of load capacitance at the output pin. The filters approximate a 4th-order Butterworth characteristic with an optimization toward low overshoot and flat group delay. Likewise, they are capable of driving a 75Ω load at 1Vp-p. There is an option for the video output to be DC coupled which limits the drive to 1 output.

Functional Block Diagram
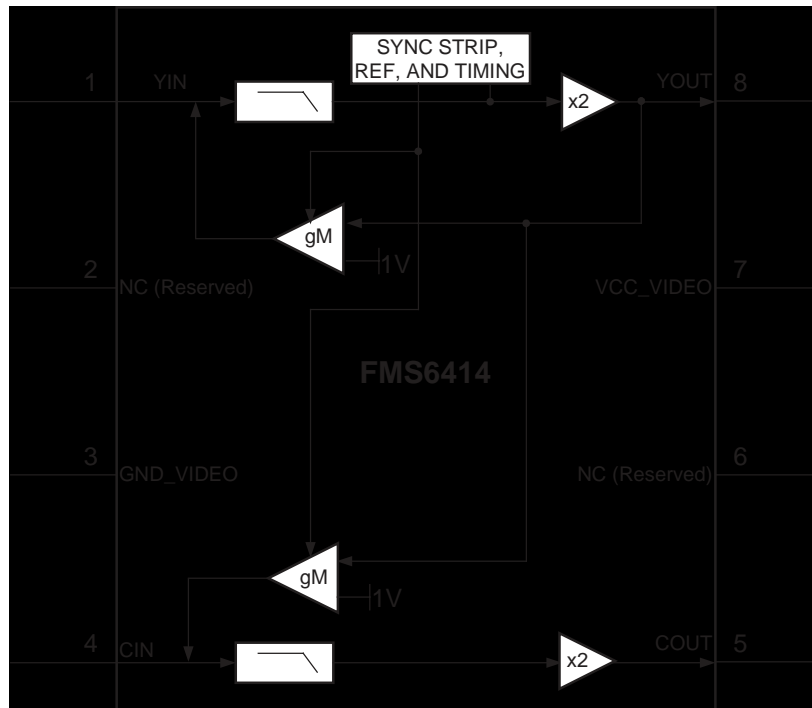
Pin Description
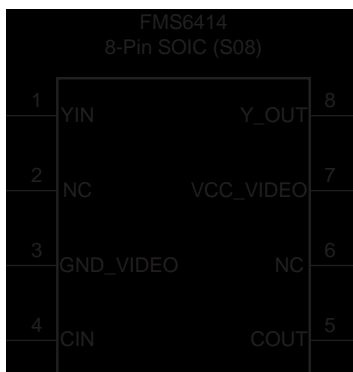
Video Section

Pin#	Pin	Type	Description
1	YIN	Input	Luma (Luminance) / Composite Input
4	CIN	Input	Chroma (Chrominance) Input
5	COUT	Output	Filtered Chroma (Chrominance) Output
8	YOUT	Output	Filtered Luma (Luminance) Output

Power/Ground Pins

Pin#	Pin	Type	Description
7	VCC_VIDEO	Power	+5 VDC for Video
3	GND_VIDEO	Power	Ground for Video
6	NC	NC	Reserved (Need to Float)
2	NC	NC	Reserved (Need to Float)

Functional Description

Introduction

The FMS6414 is a monolithic continuous time video filter designed for reconstructing the luminance, chrominance, or composite video signals from D/A source. The chip is intended for use in applications with AC coupled input and AC coupled outputs. (See Figure 1) The reconstruction filters approximate a 4th-order Butterworth characteristic with an optimization toward low over-shoot and flat group delay. The video outputs are each capable of driving 2VP-P into an AC coupled 150Ω video load, with up to 35pF of load capacitance at the output pin. The channel is clamped during sync to establish the appropriate output voltage swing range. Thus the input coupling capacitors do not behave according to the conventional RC time constant. Clamping for all channels settles to less than 10mv within 5ms of a change in video input source. In most applications the input coupling capacitors are 0.1μF. The input typically sinks 1μA during active video, which nominally tilts a horizontal line by about 2mV at the Video output. During sync, the clamp typically

sources 20μA to restore the DC level. The net result is that the average input current is zero. Any change in the input coupling capacitor's value will inversely alter the amount of tilt per line. Such a change will also linearly affect the clamp response time. This product is robust and stable under all stated load and input conditions. Capacitive bypassing VCC directly to ground ensures this performance.

Video I/O

The video inputs are driven by either a low impedance source of 1VP-P or the output of a 75Ω terminated line. The input is required to be AC coupled via a 0.1μF coupling capacitor which allows for a settling time of 5ms. The video output is capable of driving an AC coupled 150Ω load at 2VP-P, or 1VP-P into a 75Ω load. Up to 35pF of load capacitance (at the output pin) can be driven without stability or slew issues. The output is AC coupled with a 220μF or larger AC coupling capacitor.
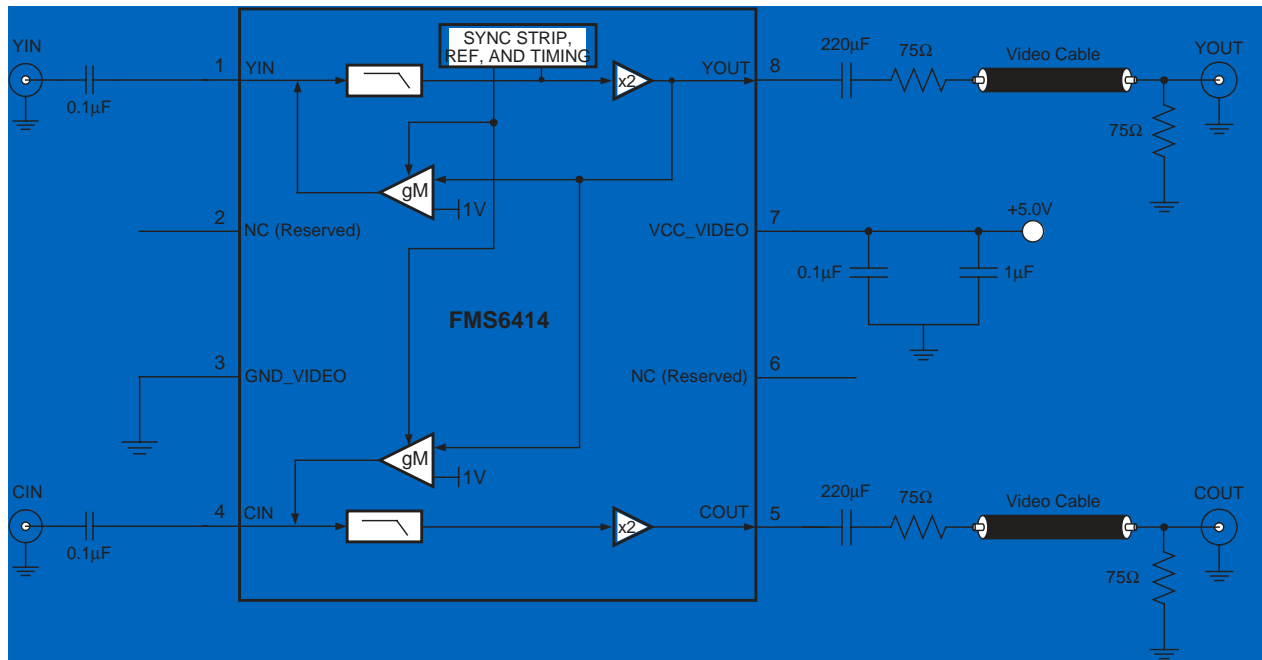
Typical Applications Diagram

Figure 1.

Absolute Maximum Ratings (beyond which the device may be damaged)

Parameter	Min	Max	Units
VCC_VIDEO (Positive DC Supply Voltage)		+6.5	V
GND_VIDEO (Negative DC Supply Voltage)			V
Analog and Digital I/O	GND – 0.3	VCC + 0.3	V
Output Current (Continuous)		60	mA
Junction Temperature		150	°C
Storage Temperature Range	-65	+150	°C
Lead Temperature (Soldering, 10s)		260	°C
Thermal Resistance (Θ_{JA})		115	°C/W

Note: Functional operation under any of these conditions is NOT implied. Performance and reliability are guaranteed only if Operating Conditions are not exceeded.

Operating Conditions

Parameter	Min	Typ	Max	Units
Temperature Range	0		70	°C
VCC_VIDEO Range	4.75	5.0	5.25	V
GND_VIDEO		0		V
ICC (+5 VDC)		60		mA

Electrical Characteristics

1Vp-p signal at room temperature

Symbol	Parameter	Condition VCC_VIDEO=+5.0V ±10%	Min	Typ	Max	Units
Video Characteristics – Unless otherwise noted, typical output loading on video output is 150Ω.						
AVYC	Low Frequency Gain (YOUT, COUT)	at 400KHz	5.75	6.0	6.25	dB
YSYNC	YOUT Output Level (During Sync)	Sync Present on YIN	0.75	1.0	1.25	V
CSYNC	COUT Output Level (During Sync)	Sync Present on YIN	1.6	2.0	2.4	V
tCLAMP	Clamp Response Time (Y Channel)	Settled to Within 10mV, 0.1µF cap on YIN and CIN		5		ms
f1dB	−1.0dB Bandwidth (Flatness) (YOUT, COUT)	No Peaking Cap (Note 1)	4.0	4.5		MHz
fC	−3dB Bandwidth (Flatness) (YOUT, COUT)			6.7	7.1		MHz
fSB	Stopband Rejection (YOUT, COUT)	fIN = 27MHz to 100MHz worst case	-37	-42		dB
Vi	Input Signal Dynamic Range (All Channels)	AC Coupled	1.3	1.4		VP-P
ISC	Output Short Circuit Current (All Channels)	YOUT, COUT to GND (Note 2)		40	80	mA
CL	Output Shunt Capacitance	All Channels		35		pF
dG	Differential Gain	YOUT, COUT		0.4		%
dP	Differential Phase	YOUT, COUT		0.4		°
THD	Output Distortion (All Channels)	YOUT/ COUT = 1.8VP-P at 3.58/ 4.43MHz		0.8		%
XTALK	Crosstalk	From CIN of 0.5VP-P at 3.58MHz to YOUT		-55		dB
		From YIN Input of 0.4VP-P at 3.58MHz, to COUT		-58		dB
PSRR	PSRR (All Channels)	0.5VP-P (100kHz) at VCC		-40		dB
SNR	Y, C Channel	NTC-7 weighting 4.2 MHz lowpass		-75		dB
tpd	Group Delay (Y, C)	100kHz		70		ns
Δtpd	Group Delay Deviation from Flatness (Y, C)	to 3.58MHz (NTSC)		9		ns
		to 4.43MHz (PAL)		7		ns
tSKEW	Skew between YOUT and COUT	At 1MHz		0		ns

Notes:

1. Peaking capacitor increases output at 4.2MHz nominally by 0.7dB
2. Sustained short circuit protection limited to 10 seconds

Mechanical Dimensions Inches (millimeters)

Package: S08
8-Pin SOIC

0.189 - 0.199
(4.80 - 5.06)

PIN 1 ID

0.148 - 0.158
(3.76 - 4.01)

0.228 - 0.244
(5.79 - 6.20)

0.017 - 0.027
(0.43 - 0.68)
(4 PLACES)

0.050 BSC
(1.27 BSC)

0.069 - 0.069
(1.49 - 1.75)

0° - 8°

0.055 - 0.061
(1.40 - 1.55)

0.012 - 0.020
(0.30 - 0.51)

0.004 - 0.010
(0.10 - 0.26)

0.015 - 0.035
(0.38 - 0.88)

0.006 - 0.010
(0.15 - 0.26)

SEATING PLANE
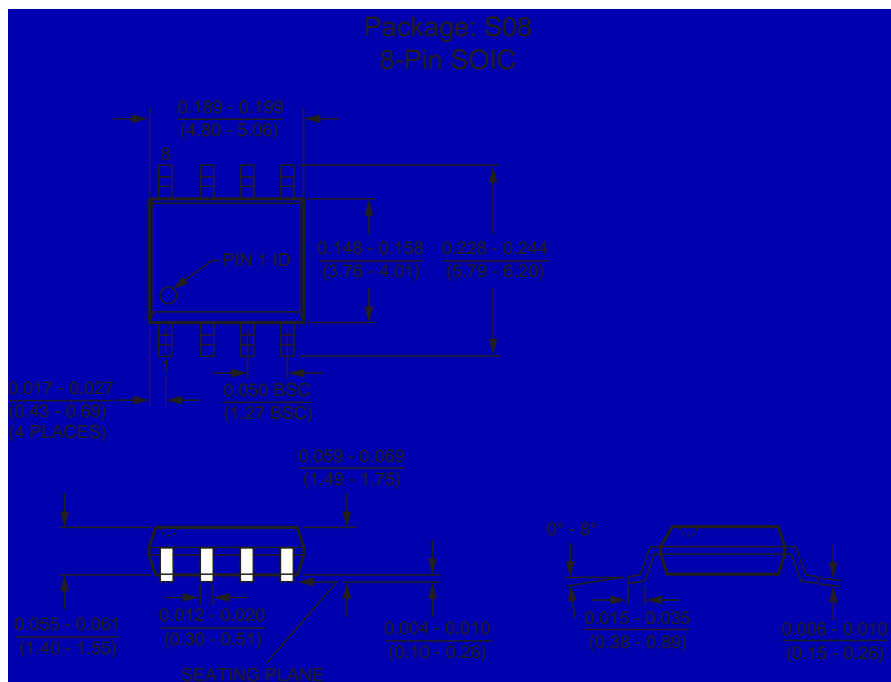
Ordering Information

Part Number	Temperature	Range Package
FMS6414CS	0° to 70°	8 Pin SOIC (S08)
FMS6414CSX	0° to 70°	Tape and Reel

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