

# FMS6413

## Single Channel Video Driver with Integrated Filter and Clamp

### Video Features

- Integrated Video Low Pass reconstruction filter
- Integrated output driver provides a low impedance output and delivers 2Vp-p (6dB gain) composite video into 150Ω.
- 7.1MHz 4<sup>th</sup> order video filter
- 0.4% differential gain with 0.4° differential phase
- Integrated DC Restore / Clamp Circuitry

### Applications

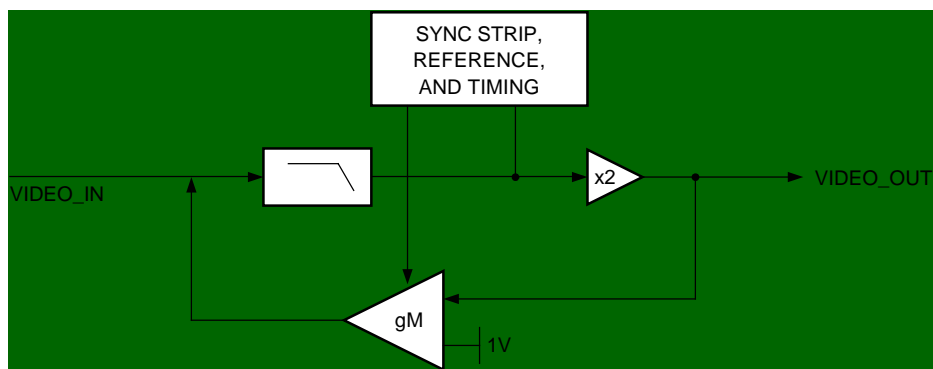
- CCTV
- DVD players
- Televisions
- HDTV
- Personal Video Recorders (PVRs)
- Video On Demand (VOD)
- Cable and Satellite Set top boxes

### General Description

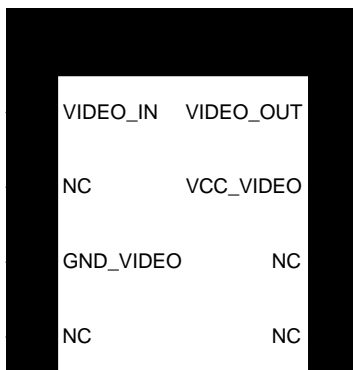
The FMS6413 Single Channel Video Filter – Driver Chip offers comprehensive video filtering for set top box or DVD applications. This part consists of a 4<sup>th</sup> order video Low Pass filter for video filtering. This device integrates a video driver so that it can directly drive to the outside world. There is also an integrated clamp circuit that allows the part to DC restore.

The video output is filtered at 7.1MHz and buffered to drive 2Vp-p into an AC coupled 150Ω load with up to 35pF of load capacitance at the output pin. The filter approximates a 4th-order Butterworth characteristic with an optimization toward low overshoot and flat group delay. Likewise, the driver is 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.

### Block Diagram



## Pin Configuration



## Pin Description

### Video Section

Pin#	Pin	Type	Description
1	VIDEO_IN	Input	Video Input
8	VIDEO_OUT	Output	Video Output: This pin is the filtered video output

### Power/Ground Pins

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

## Functional Description

### Introduction

The FMS6413 is a monolithic continuous time video filter - driver designed for reconstructing the video signals from a D/A source. This chip is intended for use in applications with AC coupled input and AC coupled outputs. (See Figure 1) The reconstruction filter approximates a 4th-order Butterworth characteristic with an optimization toward low over-shoot and flat group delay. The video output is 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 capacitor does not behave according to the conventional RC time constant. Clamping for the video channel settles to less than 10mv within 5ms of a change in video input source. In most applications the input coupling capacitor is 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 input is 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

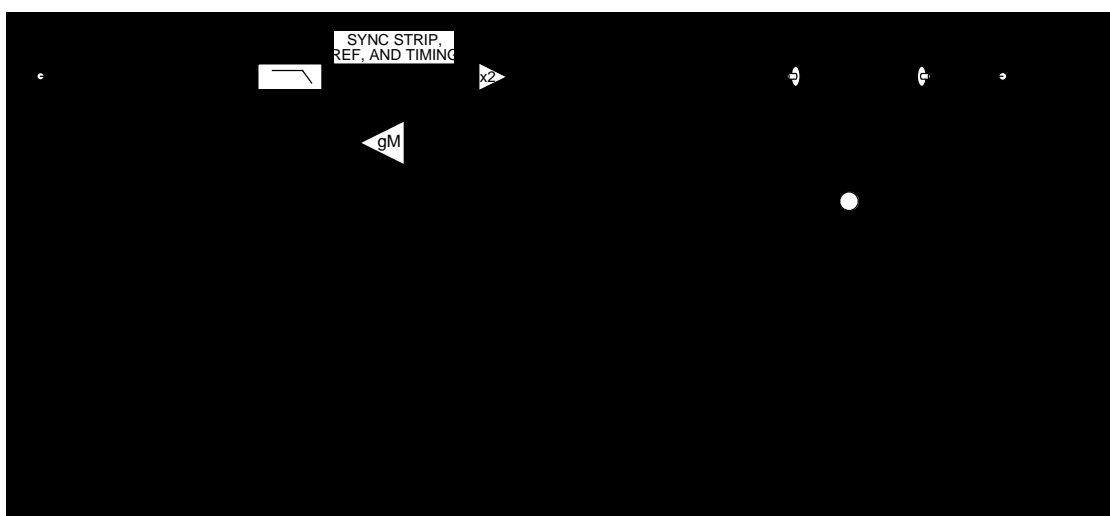


Figure 1.

## 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 ( $\theta_{JA}$ )		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

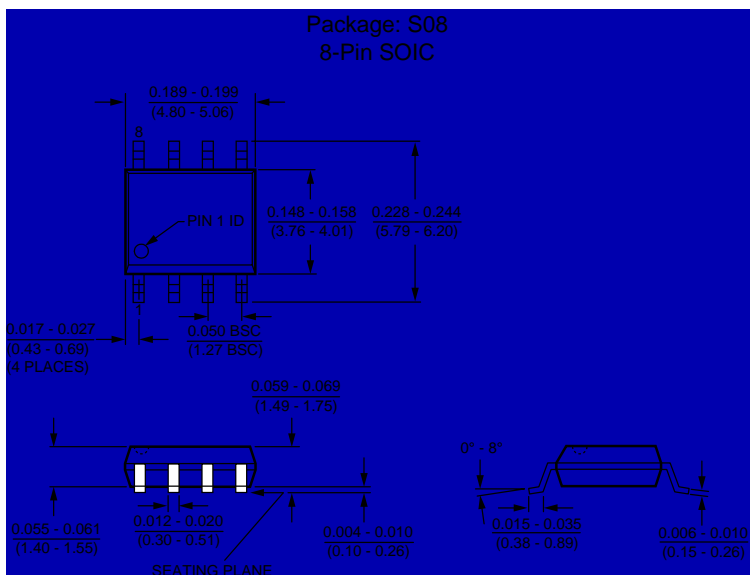
1Vp-p signal at room temperature

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

### Notes:

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

# Mechanical Dimensions Inches (millimeters)



## Ordering Information

Part Number	Temperature Range	Package
FMS6413CS	0° to 70°	8 Pin SOIC (S08)
FMS6413CSX	0° to 70°	Tape and Reel

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