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AN-8005
FMS6151 NoSAG/SAG Applications

Description

The FMS6151 is a low cost, integrated, video filter intended to replace passive LC filters and drivers in 3V portable video applications. The device will operate in applications with a V_{CC} ranging from 2.5 to 5.5V. The 5th order filter provides better image quality compared to typical 2nd and 3rd order passive solutions. FMS6151 shutdown mode allows for reduced current, typically less than 1µA, dramatically reducing power consumption for prolonged battery life.

The FMS6151 is intended to be directly driven by a DC-coupled DAC output but can also operate with input AC-coupled. The output can drive AC or DC-coupled single 75Ω coax (150Ω) load. DC-coupling the output removes the need for expensive output coupling capacitors. If the output is AC-coupled, the SAG correction circuit can be used to reduce the value and the physical size of the AC output coupling capacitors and still produce acceptable field tilt.

Offering SAG correction, fixed gain of 6dB and a 5th order low pass filter in a tiny space saving package (Micropak®) makes the FMS6151 well suited for space sensitive applications such as cellular phones and digital cameras.

Objective

The purpose of this document is to provide guidance for the typical applications of FMS6151 in SAG and NoSAG environments. The FMS6151 is very flexible and robust, yet an inexpensive device which can excel in numerous system challenges with power supply settings as low as 2.5V.

Applications

- Digital still cameras
- Camera phones
- Personal digital assistants
- Set top boxes
- Personal video recorders
- Portable media players
- Portable DVD players
- In cabin automotive entertainment
- GPS navigation displays
- Security monitoring

Features

- Power down to less than 1µA
- Small, lead (Pb) free, Micropak packaging
- AC or DC coupled outputs
- DC coupled output eliminates need for AC coupling caps
- SAG correction reduces size of AC coupling caps
- 5th order 8MHz (SD) filter
- DC coupled input
- Fixed gain of 6dB

Reference Material

- FMS6151 product data sheet
- FMS6151 demo board documentation

FMS6151 NoSAG/AC Coupled Operation

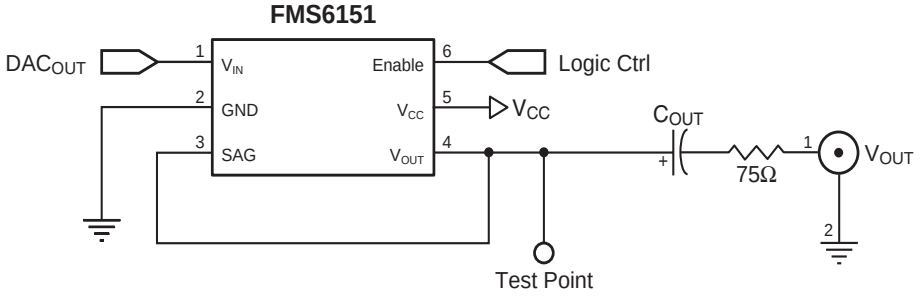


Figure 1. FMS6151 NoSAG/AC Coupled Output Application Configuration

Figure 1 is the configuration for the FMS6151 in a NoSAG/AC coupled output application. The FMS6151 is designed to be used with its input being driven by a ground based video DAC, but can also be operated with an AC coupled input. Since the device does not have a DC restore or clamp circuit the system designer will need to control the input common mode based on input video signal content, V_{cc} value and coupling method. There is a 200mV offset from ground at the output of the device and the output signal should be kept 50mV from the V_{cc} rail. Therefore with a $1V_{pp}$ signal on the input, the output will be $2V_{pp}$ which will allow a V_{cc} of 2.7V without clipping the output signal. Figure 2 shows the output of the FMS6151 with a FCC composite input. Figure 3 shows a $1V_{pp}$ field square wave at the input, biased at the ground rail. Figure 4 shows the output offset from ground 200mV and Figure 5 shows the $2V_{pp}$ output not clipped with a V_{cc} of 2.7V.

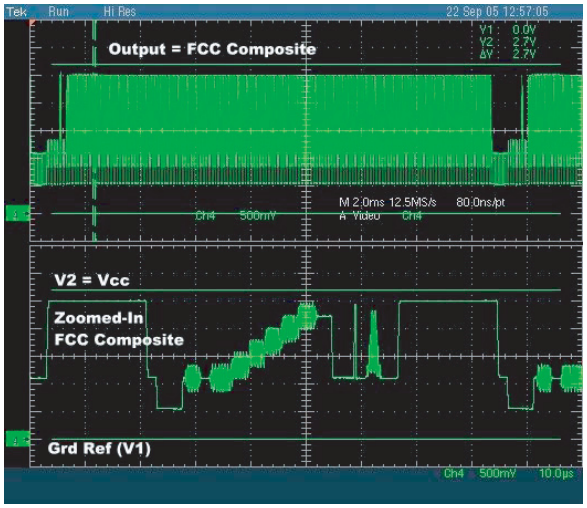


Figure 2. Output of the FMS6151 with a FCC Composite Input

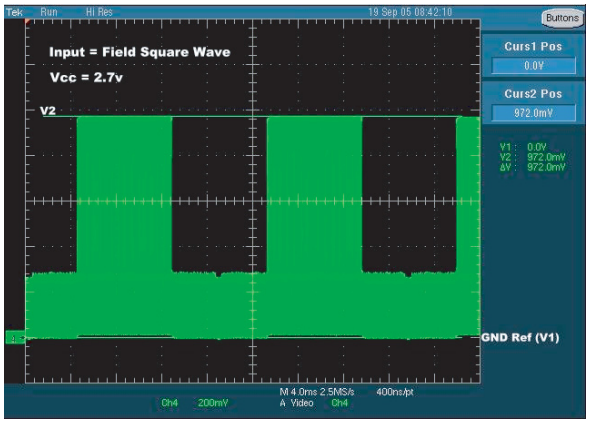


Figure 3. $1V_{pp}$ Field Square Wave at the Input, Biased at the Ground Rail

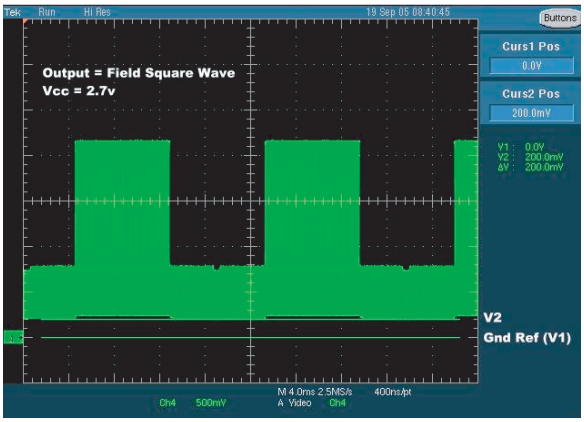


Figure 4. The Output Offset from Ground by 200mV

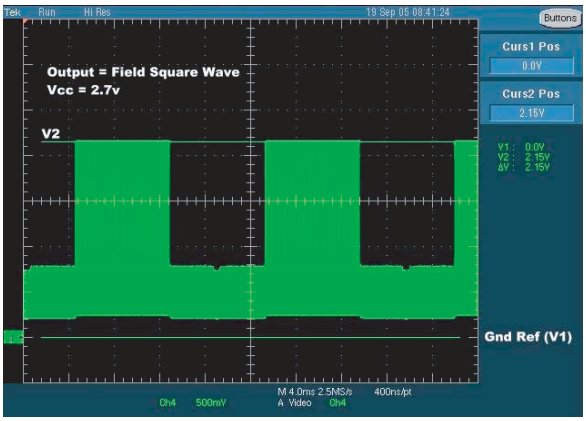


Figure 5. $2V_{pp}$ Output Not Clipped with a V_{cc} of 2.7V

FMS6151 Sag Operation

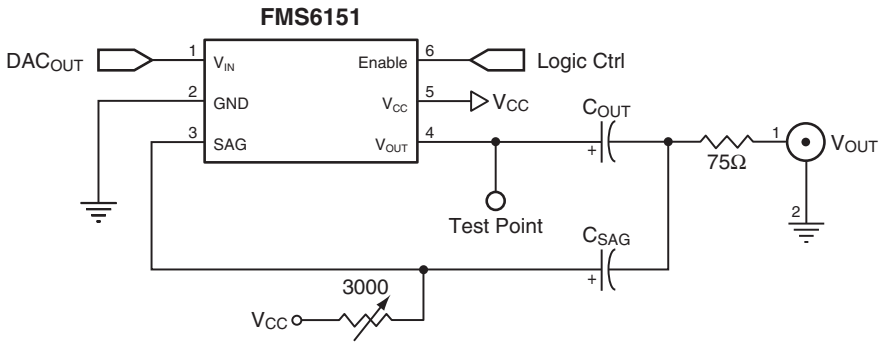


Figure 6. FMS6151 Device Configured for Operation Diagram

Figure 6 shows the device configured for operation in an application where the physical size of a 220µf capacitor is unacceptable. The recommend standard values for this operation are C_{OUT} = 47µF and C_{SAG} = 22µF. The FMS6151 is designed to use the SAG pin to compensate for the smaller capacitors and still have acceptable signal field tilt. The SAG function works by using the negative feedback pin to pre-compensate tilt caused by the C_{out} low frequency time constant. The tilt can be compensated more by replacing C_{OUT} with a 68µF or larger capacitor until the desired tilt is achieved. The SAG function has an 800mV offset at the output which is caused by a combination of signal content, SAG function 3x gain at low frequency, and the 47µF cap. By adding approximately 3kΩ between the SAG pin and V_{cc} the output can be shifted to approximately 50mv off the ground rail which then will allow for operation down to a V_{cc} of 2.7V. The device can be operated at a V_{cc} of 2.5V without clipping the output if the signal content is not a worst case Field Square Wave, but a signal such as Color Bars. Figure 7 shows the output of the device setting 800mV above ground and with a V_{cc} of 2.7V, the output is clipped. Figure 8 shows the unclipped output of the device accomplished by offsetting the SAG pin through approximately a 3kΩ resistor to V_{cc}.

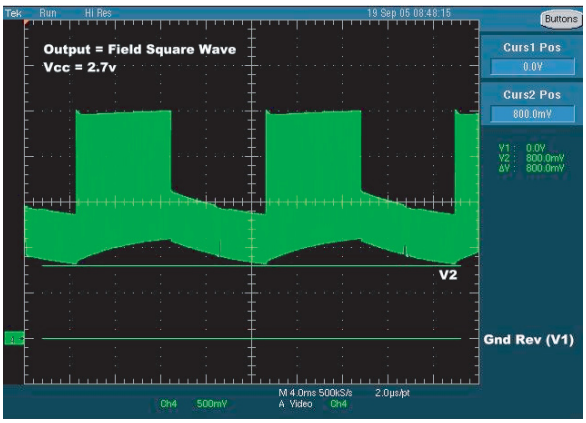


Figure 7. The Output of the Device Setting 800mV Above Ground and with a V_{cc} of 2.7V, the Top of the Waveform is Clipped

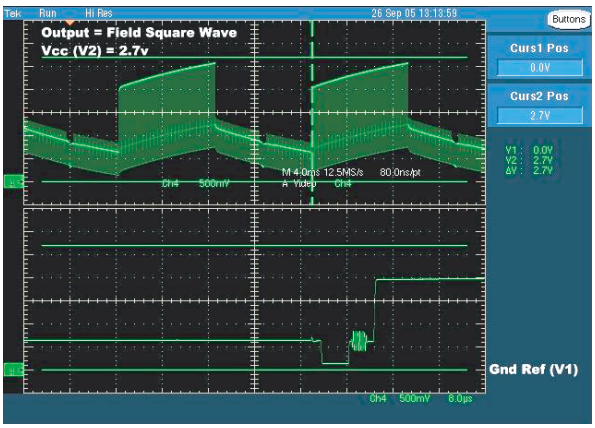
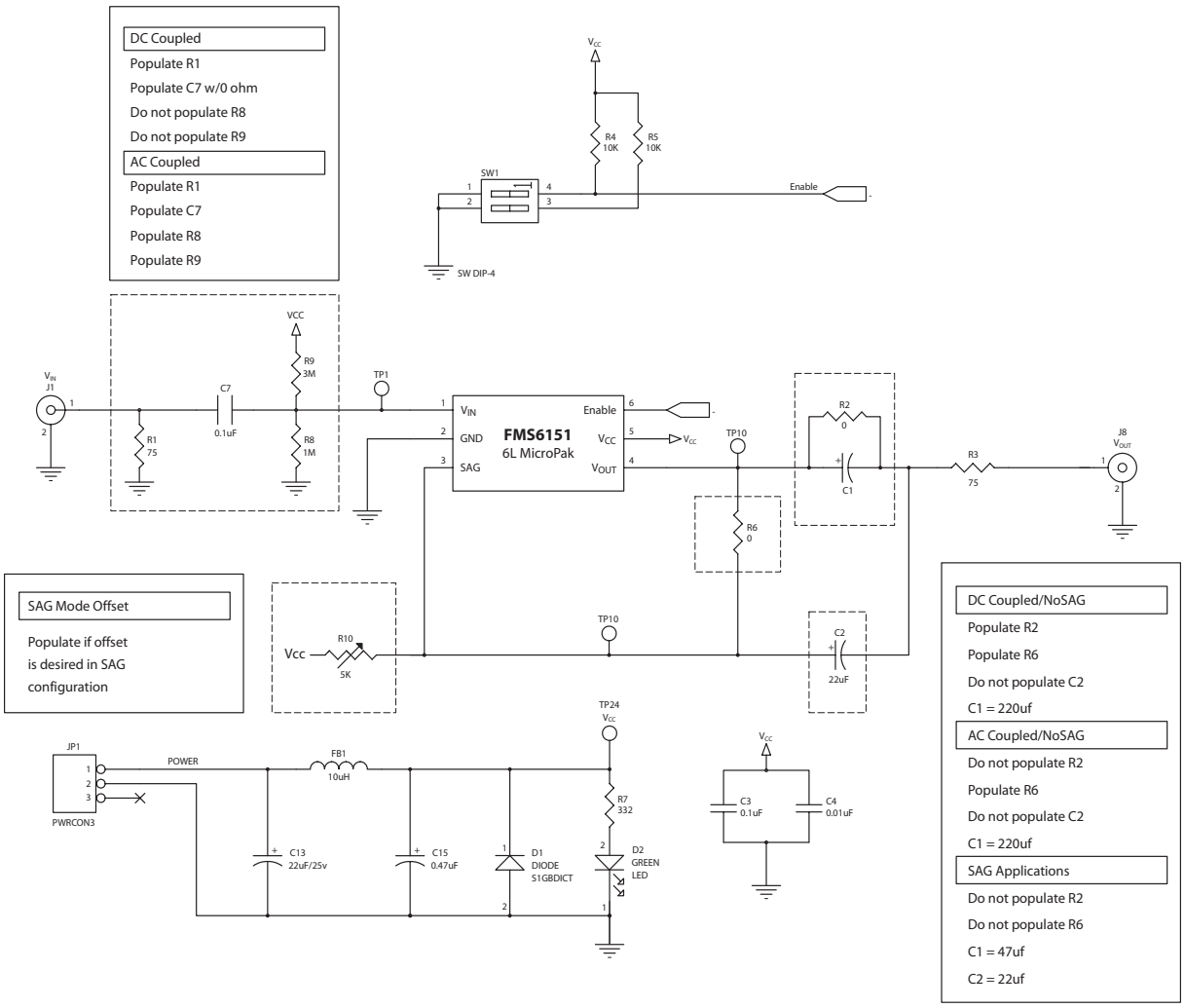


Figure 8. The Unclipped Output, Centered Between the Ground Rail and the 2.7V V_{cc} Rail

FMS6151 NoSAG/SAG Demo Board



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