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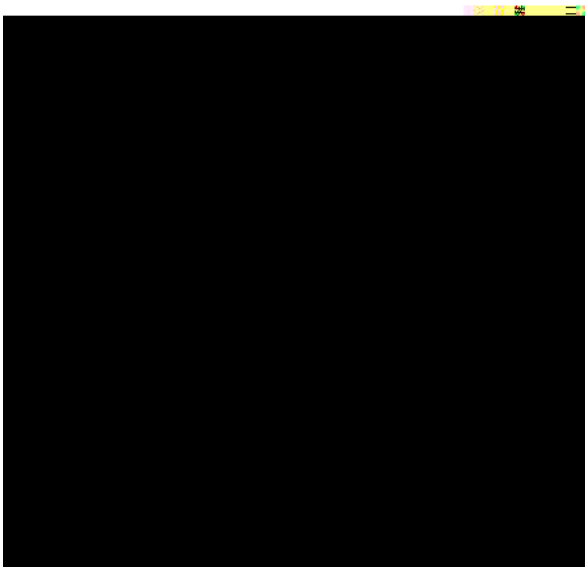

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Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.

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FAIRCHILD
SEMICONDUCTOR®

May 2011

FMS6646
Six Channel, SD/HD 1080p Video Filter Driver

Features

- Three Selectable 8/75MHz (SD/HD 1080p) Filters
- Three Fixed 8MHz (SD) Filters
- Transparent Input Clamping
- Single Video Load Drive ($2V_{PP}$, 150Ω, A_V = 6dB)
- AC- or DC-Coupled Inputs
- AC- or DC-Coupled Outputs
- DC-Coupled Outputs Eliminate AC-Coupling Capacitors
- Low-Power
- Robust Output ESD Protection: 9kV HBM

Applications

- Cable and Satellite Set-Top Boxes
- DVD Players
- HDTV
- Personal Video Recorders (PVR)
- Video On Demand (VOD)

Description

The FMS6646 Low Cost Video Filter (LCVF) is intended to replace passive LC filters and drivers with a low-cost integrated device. Six Butterworth filters provide improved image quality compared to typical passive solutions. The combination of low-power Standard-Definition (SD) and High-Definition (HD 1080p) filters greatly simplifies DVD video output circuitry. Three channels offer fixed SD filters, while the other three are selectable between SD and HD filters.

The FMS6646 offers a fixed gain of 6dB.

The FMS6646 may be directly driven by a DC-coupled DAC output or an AC-coupled signal. Internal diode clamps and bias circuitry may be used if AC-coupled inputs are required *(see the Applications Information section for details)*.

The outputs can drive AC- or DC-coupled single (150Ω) video loads. DC-coupling the outputs removes the need for output coupling capacitors. The input DC levels are offset approximately +280mV at the output.

Ordering Information

Part Number	Operating Temperature Range	Gain Setting	Package	Packing Method

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Pin Configuration

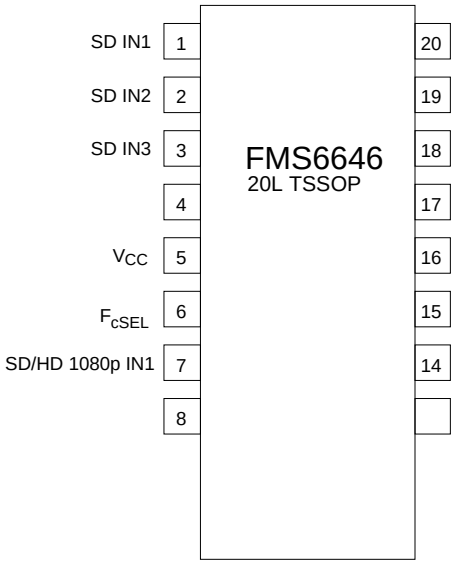

Figure 2. Pin Configuration

Pin Definitions

Pin#	Name	Type	Description
1	SD IN1	Input	SD video input, channel 1
2	SD IN2	Input	SD video input, channel 2
3	SD IN3	Input	SD video input, channel 3
4	N/C	Input	No Connection
5	V_{CC}	Input	+3.3V supply
6	F_{cSEL}	Input	Selects filter corner frequency for pins 7, 8, and 9: “0” = SD, “1” = HD (1080p)
7	SD/HD (1080p) IN1	Input	Selectable SD or HD (1080p) video input, channel 1
8	SD/HD (1080p) IN2	Input	Selectable SD or HD (1080p) video input, channel 2
9	SD/HD (1080p) IN3	Input	Selectable SD or HD (1080p) video input, channel 3
10	N/C	Input	No Connection
11	N/C	Input	No Connection
12	SD/HD (1080p) OUT3	Output	Filtered SD or HD (1080p) video output, channel 3
13	SD/HD (1080p) OUT2	Output	Filtered SD or HD (1080p) video output, channel 2
14	SD/HD (1080p) OUT1	Output	Filtered SD or HD (1080p) video output, channel 1
15	N/C	Input	No Connection
16	GND	Input	Must be tied to ground
17	GND	Input	Must be tied to ground
18	SD OUT3	Output	Filtered SD video output, channel 3
19	SD OUT2	Output	Filtered SD video output, channel 2
20	SD OUT1	Output	Filtered SD video output, channel 1

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Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameter	Min.	Max.	Unit

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Standard-Definition (480i) Electrical Characteristics

Unless otherwise noted, T_A=25°C, V_{IN}=1V_{PP}, V_{CC}=3.3V, R_{SOURCE}=37.5

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Typical Performance Characteristics (Continued)

Figure 6. HD Frequency Response (Flatness)

Typical Application

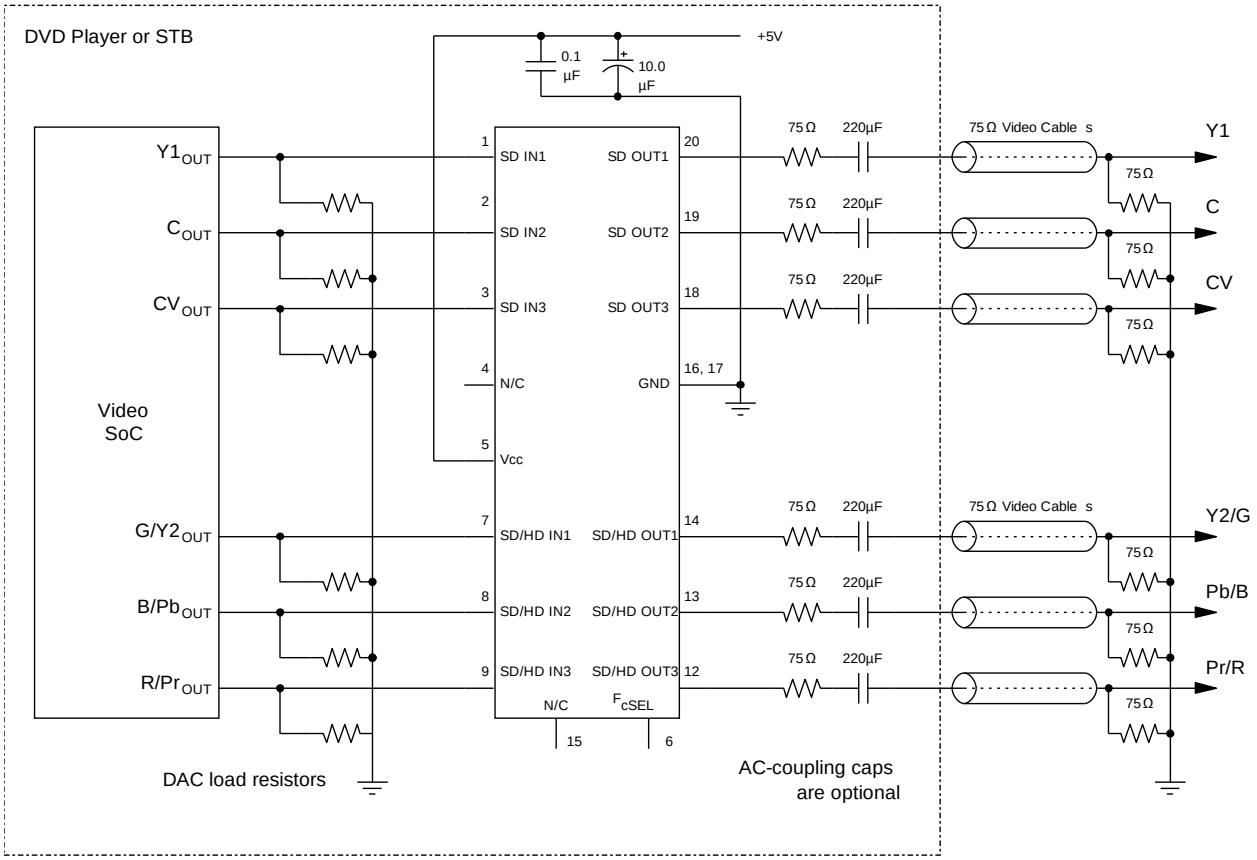

Figure 9. Typical Application

Applications Information

Functional Description

The FMS6646 Low-Cost Video Filter (LCVF) provides 6dB gain from input to output. In addition, the input is slightly offset to optimize t

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The same method can be used for biased signals with the addition of a pull-up resistor to make sure the clamp never operates. The internal pull-down resistance is 800kΩ ± 20%, so the external resistance should be 7.5MΩ to set the DC level to 500mV. If a pull-up resistance less than 7.5MΩ is desired, an external pull-down can be added such that the DC input level is set to 500mV.

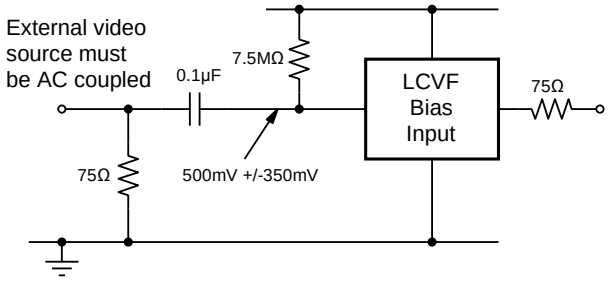

Figure 15. Biased SCART with DC-Coupled Outputs

The same circuits can be used with AC-coupled outputs if desired, as shown in Figure 16.

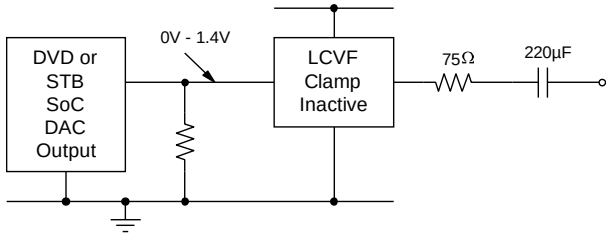

Figure 16. DC-Coupled Inputs, AC-Coupled Outputs

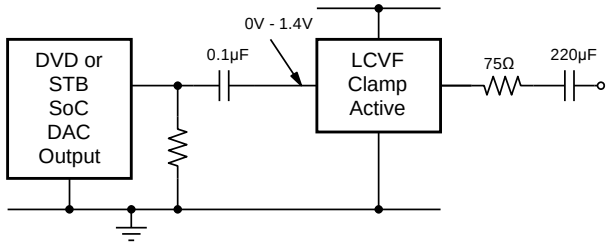

Figure 17. Coupled Inputs, AC-Coupled Outputs

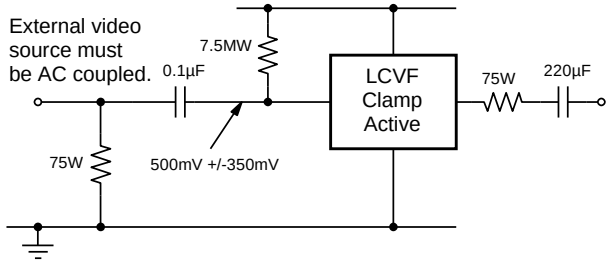

Figure 18. Biased SCART with AC-Coupled Outputs

Note:

6. The video tilt or line time distortion is dominated by the AC-coupling capacitor. The value may need to be increased beyond 220µF to obtain satisfactory operation in some applications.

Power Dissipation

The FMS6646 output drive configuration must be considered when calculating overall power dissipation. Care must be taken not to exceed the maximum die junction temperature. The following example can be used to calculate the FMS6646's power dissipation and internal temperature rise:

$T_J = T_A + P_d \bullet \theta_{JA}$

where $P_d = P_{CH1} + P_{CH2} + P_{CHx}$ and

$P_{CHx} = V_S \bullet I_{CH} - (V_O^2/R_L)$

where $V_O = 2V_{IN} + 0.280V$

$I_{CH} = (I_{CC} / 6) + (V_O/R_L)$

V_{IN} = RMS value of input signal

I_{CC} = 90mA , V_S = 3.3V

R_L = channel load resistance

Board layout can affect thermal characteristics. *Refer to the Layout Considerations section for more information.*

Output Considerations

The FMS6646 outputs will be DC offset from the input by 150mv therefore $V_{OUT} = 2*V_{IN}$ DC+150mv. This offset is required to obtain optimal performance from the output driver and is held at the minimum value in order to decrease the standing DC current into the load. Since the FMS6646 has a 2x (6dB) gain, the output is typically connected via a 75Ω series back-matching resistor followed by the 75Ω video cable. Because of the inherent divide by two of this configuration, the blanking level at the load of the video signal is always less then 1V. When AC-coupling the output ensure that the coupling capacitor of choice will pass the lowest frequency content in the video signal and that line time distortion (video tilt) is kept as low as possible.

The selection of the coupling capacitor is a function of the subsequent circuit input impedance and the leakage current of the input being driven. In order to obtain the highest quality output video signal the series termination resistor must be placed as close to the device output pin as possible. This greatly reduces the parasitic capacitance and inductance effect on the FMS6646 output driver. Recommend distance from device pin to place series termination resistor should be no greater than 0.1 inches.

Figure 19. Distance from Device Pin to Series Termination Resistor

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Layout Considerations

General layout and supply bypassing play major roles in high-frequency performance and thermal

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Physical Dimensions

Figure 20.20-Lead Thin Shrink Small Outline Package (TSSOP)

Package drawings are provided as a service to customers consi

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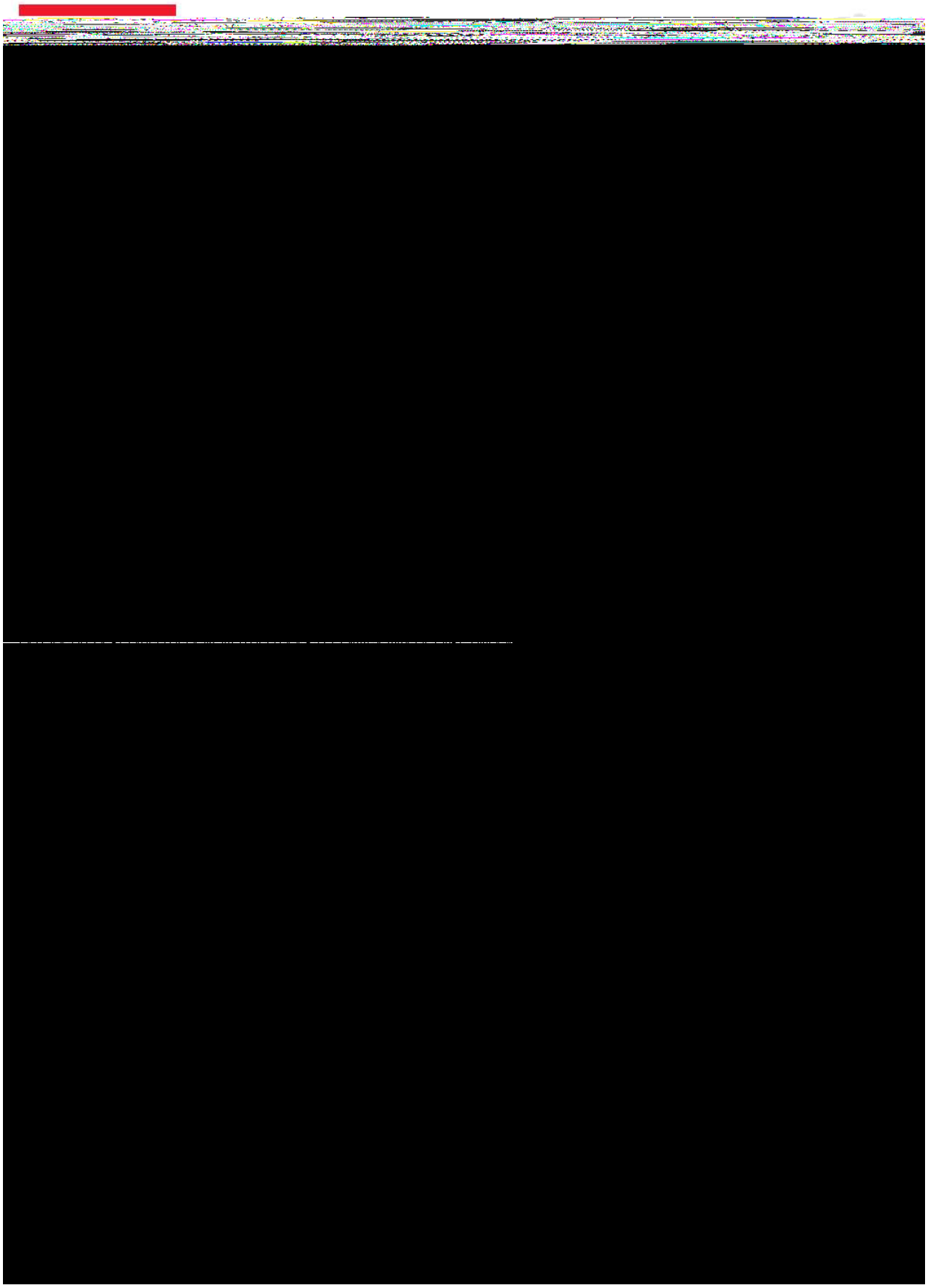

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