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AN-8006 Capacitor Selection for the FMS6410B S-Video Filter

Method

The FMS6410B requires $0.1\mu\text{F}$ input coupling capacitors, but may be AC or DC coupled out. Finding video quality — i.e., low ESR, equivalent series resistance, low inductance, low leakage, and constant capacitance over a frequency range from 20Hz to 6MHz — $0.1\mu\text{F}$ capacitors presents no problem. Surface mount capacitors meeting these requirements are both inexpensive and plentiful.

The FMS6410B, when AC coupled out, also requires four $220\mu\text{F}$ output coupling capacitors if all outputs are to be used. See Figure 1. However, some users may use values up to $1000\mu\text{F}$ to pass "TILT" specifications in the two-field test. In the past, when wideband signals such as video needed coupling capacitors in the hundreds of μF 's, tantalums were the only choice.

This presents a problem. The FMS6410B was designed for low-cost applications. In the quantities needed, the cost of the tantalums is greater than the cost of the filter and the other associated components. There is a solution: modern, surface mount, aluminum electrolytic capacitors designed for use in high-frequency

switching power supplies have all the necessary qualities. For a given capacitance and voltage rating these electrolytics are about the same size as the tantalums. They also have low equivalent series resistance, low inductance, and low leakage. Since they are intended for use as bypass capacitors in switching power supplies operating up to 1MHz, they have an adequate frequency response as video coupling capacitors.

Several types from several manufacturers have been investigated. Some $220\mu\text{F}$ surface mount aluminum electrolytic capacitors from Cornell Dubilier, Elna, and United Chemi-Con were indistinguishable from highquality, high-cost tantalums, as can be seen by comparing Figures 2 and 4 with Figures 3 and 5. It should be pointed out that these are not the only suppliers of usable capacitors. Any physically small, surface mount, $220\mu\text{F}$, 6V to 10V, aluminum electrolytic capacitor with ESR less than 1Ω at 6MHz and with less than 2% capacitance change from 20Hz to 6MHz is a candidate for use in FMS6410B circuits. Many capacitors meet these requirements. With the right capacitors, their cost is no barrier to using the FMS6410B.

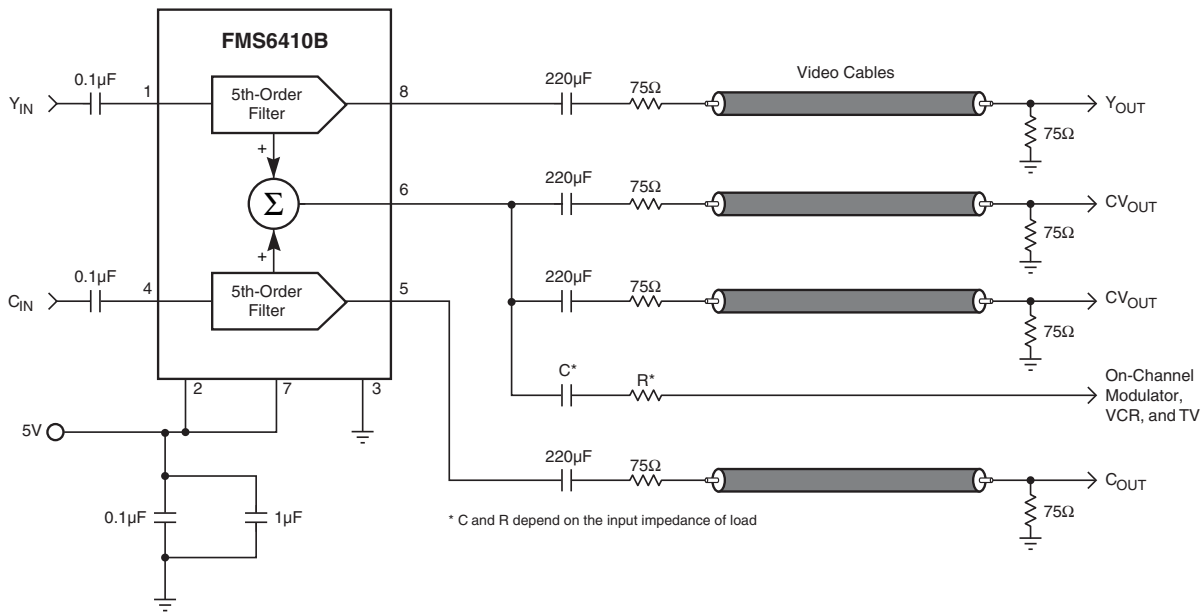


Figure 1. AC Coupled S-Video and Composite Video Line Driver for NTSC

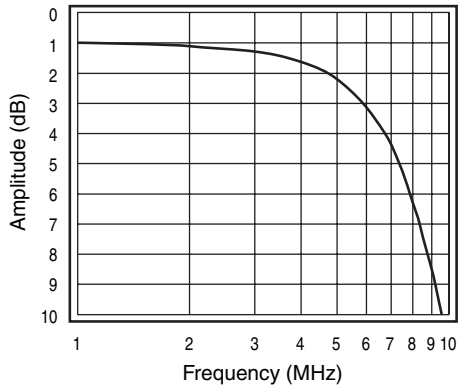


Figure 2. -3dB Response with Tantalum Capacitor

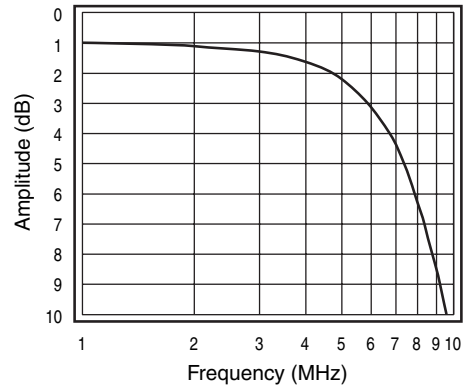


Figure 3. -3dB Response with Aluminum Electrolytic Capacitor

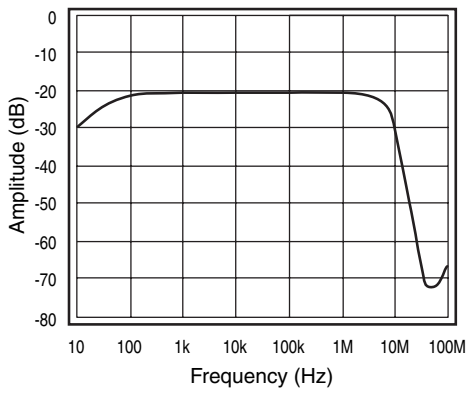


Figure 4. Wideband Response with Tantalum Capacitor

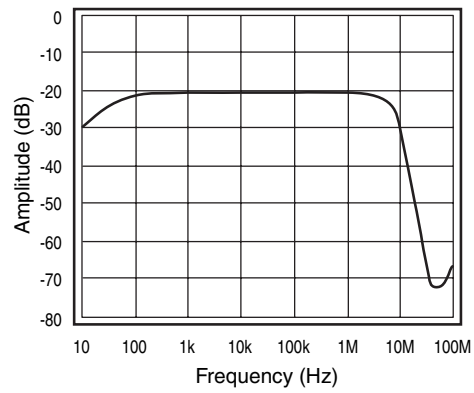


Figure 5. Wideband Response with Aluminum Electrolytic Capacitor

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