

AD9883A to AD9985 Design Conversion Considerations

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OVERVIEW

The AD9985 is a pin-for-pin replacement of the AD9883A that includes an automatic offset calibration feature. By monitoring the output of each ADC during the back porch of the input signals, the AD9985 can self-adjust to eliminate any offset errors in its own ADC channels as well as any offset errors present on the incoming graphics or video signals.

REGISTER DIFFERENCES

Registers 0x00–0x15 on the AD9985 are identical to the AD9883A. Table 1 shows the new registers on the AD9985 that control the Auto Offset function.

In addition to these new registers, the functionality of the offset registers (0x0B – 0x0D) is slightly different when the Auto Offset function is enabled, as shown in Table 2.

Table 1.

Register	Bit	Bit Name	Bit Description
0x16 – 0x18	7:0	Test Registers	These registers are reserved for future use.
0x19	7:0	Red Target Code	Sets the Red (Pr) channel target code when Auto Offset is enabled (0x1D:7 = 1).
0x1A	7:0	Green Target Code	Sets the Green (Y) channel target code when Auto Offset is enabled (0x1D:7 = 1).
0x1B	7:0	Blue Target Code	Sets the Blue (Pb) channel target code when Auto Offset is enabled (0x1D:7 = 1).
0x1C	7:0	Test Bits	Must be set to default (11\h) for proper operation.
0x1D	7 6 5:2 1:0	Auto Offset Enable Hold Auto Offset Test Bits Update Mode	0 = Auto Offset disabled, 1 = Auto Offset enabled. 0 = Update Auto Offset circuit according to bits 1:0 of 0x1D. 1 = Hold the current Auto Offset circuit value. Must be set to default (**10 01**) for proper operation. Determines how often the Auto Offset circuit is updated: 00 = every clamp 01 = every 16 clamps 10 = every 64 clamps 11 = not valid
0x1E	7:0	Test Register	Must be set to default (0x00) for proper operation.

Table 2.

Register	Normal Function	Auto Offset Function
0x0B	Red Channel Offset (in binary notation)	Red channel offset from target code (0x19) (value in twos compliment notation).
0x0C	Green Channel Offset (in binary notation)	Green channel offset from target code (0x1A) (value in twos compliment notation).
0x0D	Blue Channel Offset (in binary notation)	Blue channel offset from target code (0x1B) (value in twos compliment notation).

USING AUTO OFFSET

To activate the Auto Offset mode, set Register 0x1D, Bit 7, to 1. Next, the target code registers (0x19 through 0x1B) must be programmed. The values programmed into the target code registers should be the output code desired from the AD9985 during the back porch reference time. For example, for RGB signals, all three registers would normally be programmed to code 1, while for YPbPr signals, the green (Y) channel would normally be programmed to code 1, and the blue and red channels (Pb and Pr) would normally be set to 128. Any target code value between 1 and 254 can be set, although the AD9985's offset range may not be able to reach every value. Intended target code values range from (but aren't limited to) 1 to 40 when ground clamping, and 90 to 170 when mid scale clamping.

The ability to program a target code for each channel gives users a large degree of freedom and flexibility. While in most cases all channels will be set to either 1 or 128, the flexibility to select other values allows for the possibility of inserting intentional skews between channels. It also allows for the ADC range to be skewed

so that voltages outside of the normal range can be digitized. (For example, setting the target code to 40 would allow the sync tip, which is normally below black level, to be digitized and evaluated.)

Lastly, when in Auto Offset mode, the manual offset registers (0x0B to 0x0D) have new functionality. The values in these registers are digitally added to the value of the ADC output. The purpose of doing this is to match a benefit that is present with manual offset adjustment. Adjusting these registers is an easy way to make brightness adjustments. Although some signal range is lost with this method, it has proven to be a very popular function. In order to be able to increase and decrease brightness, the values in these registers in this mode are signed twos complement. The digital adder is only used when in Auto Offset mode. Although it cannot be disabled, setting the offset registers to all 0s will effectively disable it by always adding 0.

PCB CONSIDERATIONS FOR COMPATIBILITY

Since the pin definitions for the AD9883A and the AD9985 are identical, there are no changes necessary in the PCB layout.