Application Brief

AMC1306 to AMC0306 Migration Guide

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Introduction

The AMC0306 is a new generation modulator that comes in a smaller package size for B-ISO and F-ISO for space and cost optimized designs. The AMC0306 is also an excellent alternative for the AMC1306. This migration guide helps customers that are familiar with the AMC1306 to transition to the AMC0306/0206/0106 parts.

The AMC0306 has a different digital interface timing than the AMC1306 which can increase the minimum hold time at the MCU and cause timing mismatch between the MCU and device if used without a software adjustment. A drop-in replacement with this new device can also require common-mode filter capacitors for improved parametric performance. This application brief offers background on this specification change as well as outlines adjustments and resources.

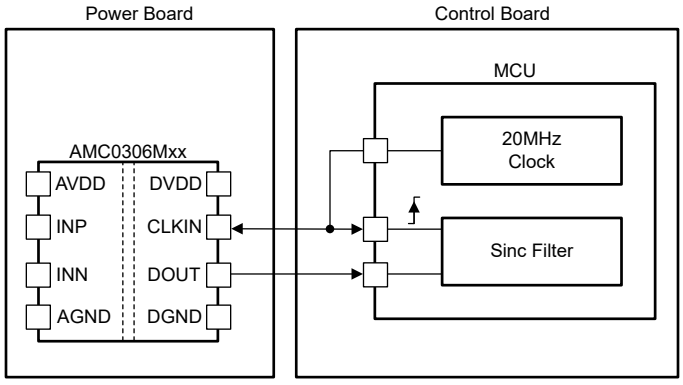

Figure 1. AMC0306 Block Diagram

Migration Guide

The AMC0306 and the AMC1306 are both precision, delta-sigma isolated modulators compatible for interfacing with various MCUs. The devices allow for very precise current measurements with reinforced isolation, promoting accuracy and safety in sensitive applications. The new AMC0306 is intended to be functionally and layout compatible to the previous AMC1306. When replacing the AMC1306 with the AMC0306, validate that your MCU or FPGA setup and hold times still meet the additional 15ns delay of the AMC0306. Otherwise, this can yield to incorrect data. The recommendation is to validate the timing as described in the *Clock Edge Delay Compensation With Isolated Modulators Digital Interface to MCUs* application note and with the *Isolated Modulator Digital Communication Timing Calculation Tool* too. Additionally, confirm recommended input filter considerations are followed to tailor linearity and noise performance.

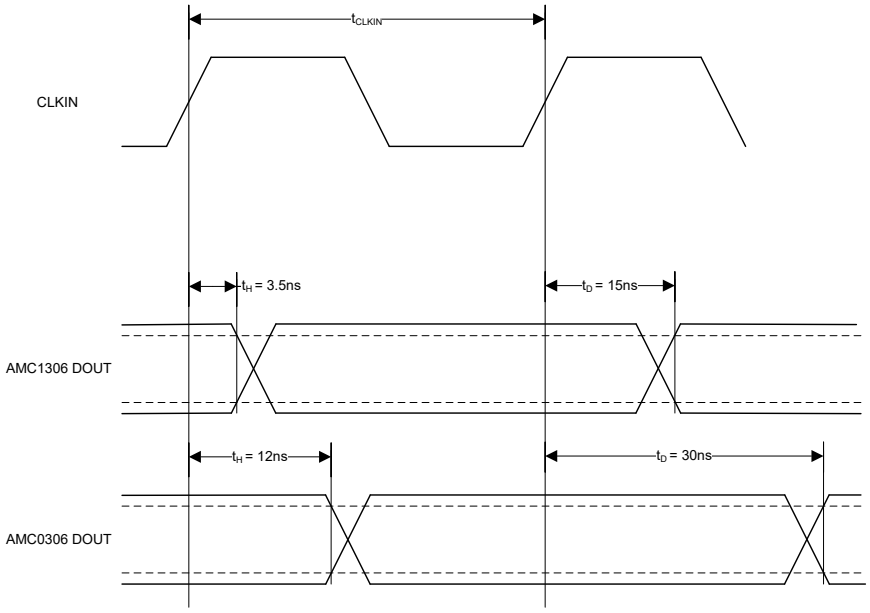

Figure 2. AMC0306 vs AMC1306 Digital Interface Timing Comparison

Figure 2 demonstrates the digital interface timing for setup and hold times of AMC0306x devices compared to AMC1306x devices. The AMC0306 features a data hold time, t_H(MIN), of 12ns and a data delay time, t_D(MAX), of 30ns. Previously, the AMC1306x devices featured a data hold time, t_H(MIN), of 3.5ns and a data delay time, t_D(MAX), of 15ns. A software modification to account for these timing adjustments is necessary to make sure there is reliable data acquisition by the MCU from the isolated modulator.

The software change necessary needs to make sure that the clock signal provided is timed to allow the digital bit stream sufficient time to both stabilize before the clock edge and remain stable after the clock edge. As outlined in the previously linked application note, there are two software changes that can be applicable. First, a clock inversion at the MCU to sample on the falling edge of the external clock instead of the rising edge. Inverting the clock signal can add a fixed one-half clock period delay to the clock signal. Based on the timing specifications of a given system, this can accommodate the new setup and hold timings of the AMC0306. However, since this compensation method only offers a fixed time delay, this must be verified for each system's MCU requirements whether this suffices or not. See *Section 3.4 Clock Signal Compensation by Clock Inversion at the MCU* of the linked application note for more information. A second option is incorporating an additional software configurable phase delay to move the clock edge to a designed for data sampling point. This compensation technique offers the most flexibility in user configurability. The clock signal's rising edge can be phase-shifted so that the data sampling point and clock edge meet timing alignment again. See *Section 3.1 Clock Signal Compensation With Software Configurable Phase Delay* of the linked application note for more information. Furthermore, the *Isolated Modulator Digital Communication Timing Calculation Tool* has been extended to streamline determining these timing designs. See the *AMC0x06M25 Calculator* tab in the Calculation Tool for more help.

Input Filter Modification

Schematically, to maintain functional compatibility to the AMC1306, the recommendation is to implement these two input filter placements: place a 10nF or higher differential filter capacitor from INP to INN as well as place common-mode filter capacitors from INP to GND1 and from INN to GND1. Figure 3 shows the recommended example input circuitry for the AMC0306. The differential filter capacitor is advised to avoid a voltage drop at the input during the sampling period. The common-mode filter capacitors were recommended in the AMC1306 to improve fast transient pulse performance but are required in the AMC0306 to improve parametric performance.

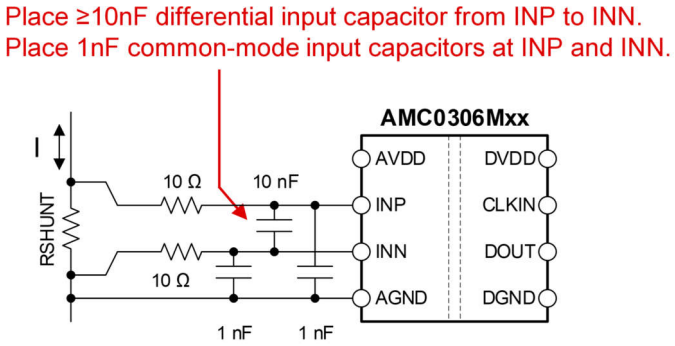

Figure 3. AMC0306 Recommended Input Circuitry

Summary

In conclusion, the AMC0306 features a different interface timing than the AMC1306. The difference in timing can require a software adjustment and an additional analog input differential capacitor when considering as a drop-in replacement. Using the *Isolated Modulator Digital Communication Timing Calculation Tool* can offer timing adjustment suggestions.

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