FMCW Radar Sensors

Technical notes

Operating conditions

Sivers IMA FMCW radar sensors have been tested to perform in temperatures ranging from -10 to +70C. They can be stored in temperature ranging from -50 to +10C, and can resist a shock of 100g over 6 ms (MIL-STD-202G method 213B).

All models are fully sealed and are therefore ideally suited to operation in flammable or explosive atmospheres. Every unit is factory tested and guaranteed to be air-tight.

ESD considerations

In order to ensure consistent and optimum performance, please observe all normal electro-static discharge considerations when handling Sivers IMA FMCW modules, especially before they have been installed in the final application.

1. Avoid carpets, especially in cool dry areas.
2. Wear ESD preventive clothing, including wrist straps and foot wear
3. Use antistatic floor mats and work surfaces
4. Hold the module by its edges and avoid touching the contacts before installation

Power supply / biasing

The FMCW module requires approximately 400mW of power. This is applied at 10V 1mA, 4V 60mA and 3.3V 40mA. There is no specific order in which the bias should be applied. Bias voltage should however not exceed nominal values by more than 5%. All pins not specifically labeled should not be grounded.

Data subject to change without notice. Rev. A 2011 – 06 - 2011

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Physical connections

The RS3400 series of FMCW radar modules has two basic types of interface connections. Power supply, synthesizer control, and IF output is achieved through two rows of pins formed by Samtec interconnect strips (BBL-121-G-E), which interface with Samtec SL-series or compatible socket strips. The majority of pins are dedicated to power supply, ranging from +3.3 to +10 V and 1 to 80 mA. Care should be taken to only apply vertical force when inserting or removing the module from its interface in order to prevent bent or broken pins.

The antenna connection takes place using an SMA female connector. Care should be taken when connecting a coaxial cable or adapter. It is extremely important to use two wrenches in the attachment of the cable. One is used on the wrench flats found on the female SMA connector on the module to counteract the torque of the tightening operation. The other is applied to the locking nut on the cable. Ideally this will be a torque wrench, to help ensure proper attachment force for the cable, and to prevent damage to the interface and ensure the best connection. The recommended tightening torque is 0.3 – 0.6 N-m. An alternative method for connecting an antenna is to use a male-to-male SMA adapter. This provides a more direct, and therefore higher quality signal. Additional care must be taken in this case to avoid bending or damaging the SMA connector when handling the assembled system, due to the additional leverage provided by the antenna.

IF output signal characteristics

The output from the FMCW module is an IF-signal. No additional termination is necessary. The maximum signal level is approximately 500mVpp. Typical measurements may contain signal components with this magnitude due to inadvertent reflections in the system, but it is unlikely. The usual signal that is to be identified is however substantially smaller, typically in the single mV range or smaller. Based on the nature of FMCW systems, close reflections with a high magnitude will have a lower IF signal frequency than more distant reflections that usually are to be identified. This means that it is useful to high pass filter the IF signal in order to suppress the close echoes. A simple OP-AMP design with an added gain is shown below. This circuit provides 60dB gain at approximately 600Hz and rolls off both below and above. This ensures that echoes from close objects (low frequency) and high frequency noise is suppressed. The corner frequency will vary with applications. The current setup is useful for a 1500MHz sweep with a step size of 1MHz and 50 µs dwell time at each frequency point. The IF signal should be sampled at the end of the dwell time, allowing for the system to settle completely.

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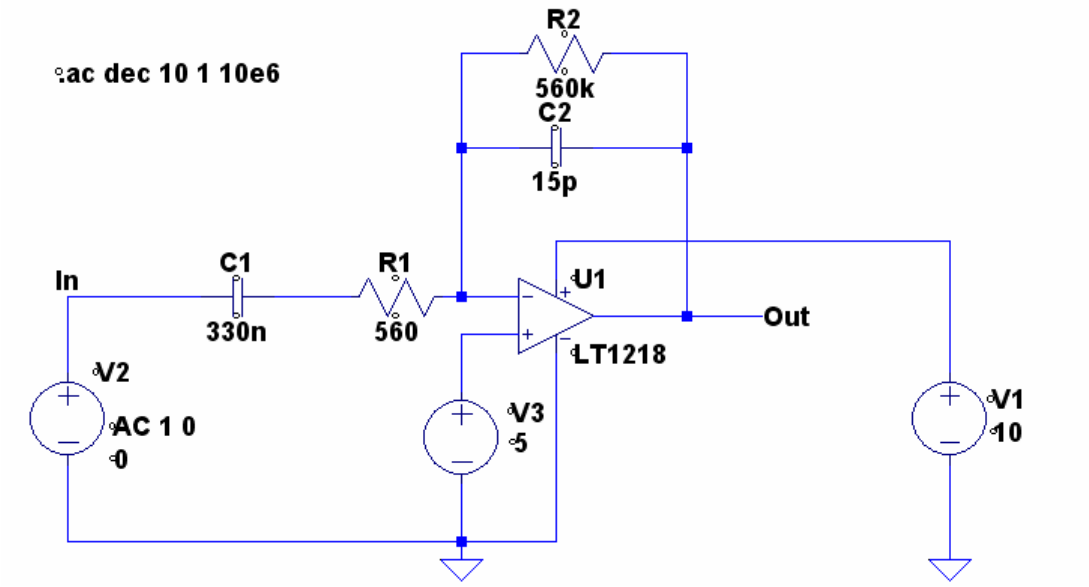

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