MPC55xx to MPC5676R eQADC compatibility

1 software compatibility

For common features, software written for the MPC55xx devices should be compatible with the MPC5676R. New features are disabled by default.

2 new features

2.1 Number of channels increased

The MPC55xx has one eQADC with two ADCs. An additional eQADC has been added to the MPC5676R providing a total of four on-chip ADCs.

2.2 Wider range of trigger inputs

A wider range of trigger inputs is now available, including PIT, eTPU and eMIOS. There are new registers in the SIU (SIU_ISEL4-7, SIU_ISEL9) that allows a wider selection of trigger inputs. By default, the trigger selection in the SIU is backwardly compatible with software written for the MPC55xx.

2.3 Additional eQADC input channels

It is possible to monitor more internal signals using eQADC channels on the MPC5676R. Power domains and bandgap voltages from the power management controller (PMC) can now be monitored by ADC conversions. There is also the inclusion of an on-chip temperature sensor, which can be monitored via an eQADC channel.

2.4 Variable gain amplifier (VGA)

A variable pre-gain stage is introduced with the VGA. This allows users to amplify a differential input by x1, x2 or x4 at the input stage (in other words before the ADC) of a differential channel. The benefit of this is improved resolution for small differential voltages.

2.5 Configurable weak pulls on differential channels

Configurable weak pulls have been implemented on differential channels to allow sensor biasing

and provide a new mechanism for sensor diagnostics. Each differential channel can be configured independently to operate with either weak pullup, weak pulldown, center bias, or no bias. The weak pull values are also independently configurable between 200 kOhm, 100 kOhm, and 5 kOhm.

2.6 Command queue (CQUEUE) streaming

On the MPC55xx eQADC, once a command had been passed from the CFIFO to the ADC to perform a conversion, the command is invalidated in the CFIFO. For small command queues, where only a couple of commands are ever used, this means that the eDMA or core would have to continually transfer the same commands to the CFIFO, once the previous commands were invalidated.

On the MPC5676R, a streaming feature has been implemented to bypass this situation. This feature allows you to choose whether commands in the CFIFO are invalidated after they have been passed to the ADC for conversion. This feature is only implemented on CFIFO0, but, once enabled, extends the CFIFO0 size to eight entries. This allows up to eight commands to be stored in CFIFO0, and it allows for the continuous conversion of these commands without their having to be updated by the eDMA or core.

2.7 Abort feature

The abort feature allows you to send a high priority conversion command that will bypass the internal ADC buffers and immediately abort the current conversion (which is restarted after the high priority conversion), thereby allowing the ADC to convert the high priority command.

2.8 Decimation filter

A configurable decimation filter has been implemented on the MPC5676R. This provides a mechanism to directly filter eQADC results before they are transferred to the RFIFO.

It is possible to use the decimation filter in two ways.

— Independently, whereby the core or eDMA can pass data into the filter, and the result is transferred back out via the same mechanism.

— Integrated with the eQADC, whereby ADC results are transferred via the decimation filter, and the output from the filter is transferred into the appropriate RFIFO on the eQADC. This way, the decimation filter is transparent to software.

2.9 eQADC timebase from STAC bus

It is possible to select one of the eTPU timebases from the STAC bus, as the time-stamping source in the eQADC. This allows eQADC results to be time-stamped relative to an angle domain, which can be useful for several engine control applications.

3 removed features

eQADC Synchronous Serial Interface (SSI) has been removed.