ADC_MEASUREMENT_ADV

Apps

Here is a list of all modules:

ADC_MEASUREMENT_ADV

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ADC_MEASUREMENT_ADV

Abbreviations and Definitions

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Abbreviations:	
DAVE™	Digital Application Virtual Engineer
APP	DAVE™ Application
API	Application Programming Interface
GUI	Graphical User Interface
MCU	Microcontroller Unit
SW	Software
HW	Hardware
LLD	Low Level Driver
IO	Input Output
ADC	Analog to Digital Conversion
VADC	Versatile Analog to Digital Converter

Definitions:	
Singleton	Only single instance of the APP is permitted
Sharable	Resource sharing with other APPs is permitted
initProvider	Provides the initialization routine
Physical connectivity	Hardware inter/intra peripheral (constant) signal connection
Conditional connectivity	Constrained hardware inter/intra peripheral signal connection
Aggregation	Indicates consumption of low level (dependent) DAVE APPs

ADC_MEASUREMENT_ADV

Overview

Overview

Scope: This APP measures multiple analog signals using the Versatile Analog to Digital Converter (VADC) peripheral. It provides advanced features such as sequencing, post processing, synchronized measurements and hardware boundary check
Some configurations are set in a required APP (ADC_SCAN or ADC_QUEUE). These configurations are read only in this APP
The features in detailed are:

1. Up to 8 analog channels (more with sync. conversion)
2. Measures a linear sequence of analog inputs (Scan request source).
3. Measures a flexible sequence of analog inputs (Queue request source).
4. Supports internal and external consumption of the request sources.
5. Software and hardware controlled start of measurements.
6. Results post processing with FIFO and Filter.
7. Synchronously channels measurement.
8. Boundary configurations for channels
9. Supports events (Request source event, Result event, Channel event, boundary flag).

Scope delimitation:
To avoid cross configuration, the background request source is not in the scope of this APP. This feature can be added without cross configuration by adding the ADC_MEASUREMENT APP to the project.

Details of provided functionalities:

1. **Number of channels and conversion details:**

   The number of channels can be configured in the APP GUI "Overview". Also the type of conversion can be selected. The conversion details (Timing, Resolution...) are read from required APP.
2. **Conversion sequence:**

   The channel names configured in the APP GUI "Channel Configuration". Also for each channel the "Wait for read" can be enabled.
   - **Scan sequence:**

     The scan sequence is a linear sequence starting with the highest enabled channel (CH7 to CH0). The assignment of the "Channel name" to the physical channel CHx is done by assigning the channel resource or by assigning the input pin.
     This is explained with an example as follows:
     If 6 measurements are configured in the GUI named as CH_A, CH_B, CH_C, CH_D, CH_E, CH_F. The channels assigned to the measurements is as follows

     CH_A = CHANNEL-2
     CH_B = CHANNEL-5
     CH_C = CHANNEL-6
     CH_D = CHANNEL-0
     CH_E = CHANNEL-4
     CH_F = CHANNEL-1

     The order of conversion sequence for these measurements is as shown in the following figure

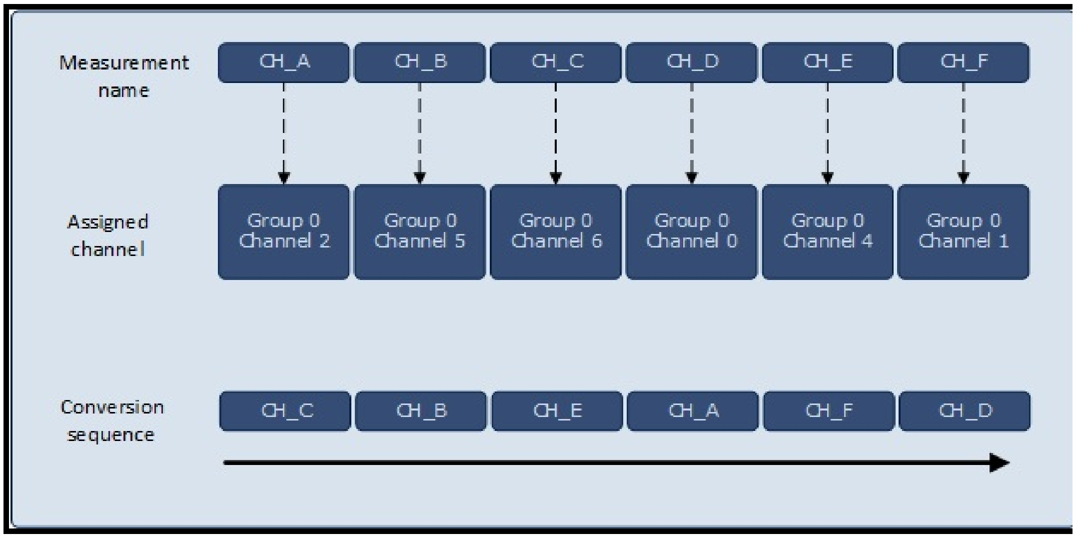


Figure 1 : Scan Conversion Sequence

- **Queue sequence:**

The queue sequence is a flexible 8 stages sequence. Each channel can be placed in any position and also multiple entries of one channel are possible. The TAB "Sequence Plan" in the APP GUI allows configuring the sequence. The assignment of the "Channel name" to the physical channel CHx is done by assigning the channel resource or by assigning the input pin. This is explained with an example as follows:
If 6 measurements are configured in the GUI named as CH_A, CH_B, CH_C, CH_D, CH_E, CH_F. The channels assigned to the measurements is as follows:

CH_A = CHANNEL-2
CH_B = CHANNEL-5
CH_C = CHANNEL-6
CH_D = CHANNEL-0
CH_E = CHANNEL-4
CH_F = CHANNEL-1

And the Queue sequence is selected as follows:

CH_B = CHANNEL-5
CH_B = CHANNEL-5
CH_B = CHANNEL-5

CH_A = CHANNEL-2
CH_C = CHANNEL-6
CH_D = CHANNEL-0
CH_F = CHANNEL-1
CH_E = CHANNEL-4

The order of conversion sequence for these measurements is as shown in the following figure

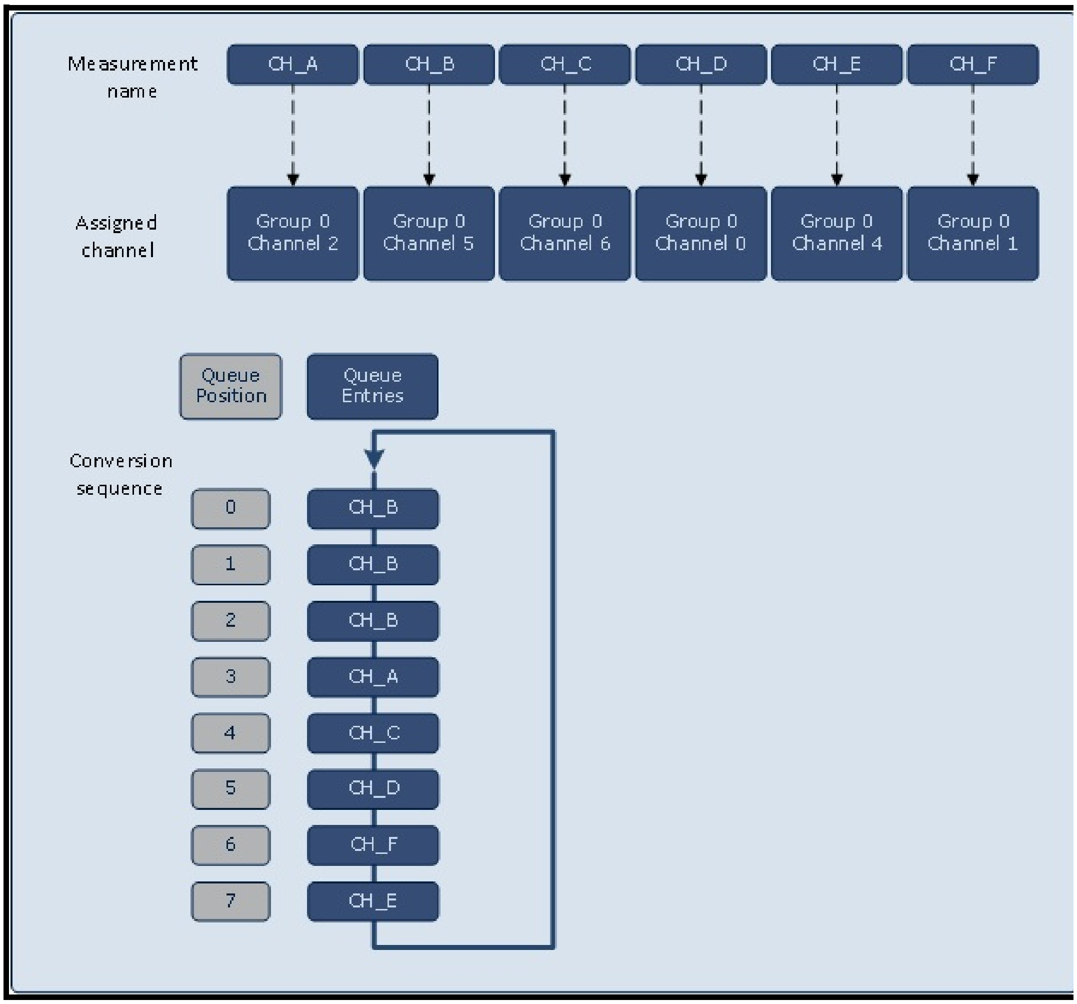


Figure 2 : Queue Conversion Sequence

3. **Expose APP:**

The APP supports the consumption of the request source inside or outside the APP. This feature shall by selecting the "Expose APP" option in the overview TAB of the APP GUI. If Expose APP is enabled, the APP consumes the required request source APP either ADC_SCAN or ADC_QUEUE depending on the selection being made. If the expose APP option is disabled then the request source will be consumed inside the APP. Use the "Expose APP" option when multiple use case APPs like **ADC_MEASUREMENT_ADV** and BUCK need to share the request source.

4. **Synchronous conversion:**

   Two or more measurements can be requested at the same time when they share the same trigger. If one of the ADC groups is already converting at this moment this measurement will be delayed compared to the other measurements. In some applications the measurement has to be done completely synchronous. For this case the APP supports the synchronous conversion mode. The synchronous conversion is implemented as master/ slave approach. If one group is a master the following group(s) can be slaves.

   To configure a group as sync master the number of slaves need to be selected in the TAB "Sync. Conversion". After this configuration each channel can be configured as master channel. A master channel will allocate the selected amount of slave channels. The master and slave group is different but the channel number is the same. Every time the master channel starts a conversion, the slave channels also start a conversion.

   For example G0 is a master group with 1 slave. This makes G1 to a slave group. As soon as "Channel_A" (from G0) is configured as Sync Master and assigned to CH3, G1 CH3 becomes a slave channel. When the master G0 CH3 is requested to convert also the slave G1 CH3 will be converted.

   Sync slave channels are named with the <master channel>_slave_<slave token>. Slave channels are exclusive consumed by the APP. The class selection, post processing and boundary configurations are copied from the master to all slaves.

If required, the class configuration can copied via APP API. This API can overwrite a class configuration if it is configured by another APP.

Note: Ensure that the "Arbitration mode" for all the sync groups is set to "Run Permanently" in GLOBAL_ADC APP.

If 6 measurements are configured in the GUI named as CH_A, CH_B, CH_C, CH_D, CH_E, CH_F slaves groups needed as 3(Group-0 is the master). CH_F(from Group-0) and CH_B(from Group-0) are configured as sync master channels. The channels in the master are using scan request source for conversion and the order of conversion is as show in the Figure 1. The sync conversion with scan request source is as shown in the following figure.

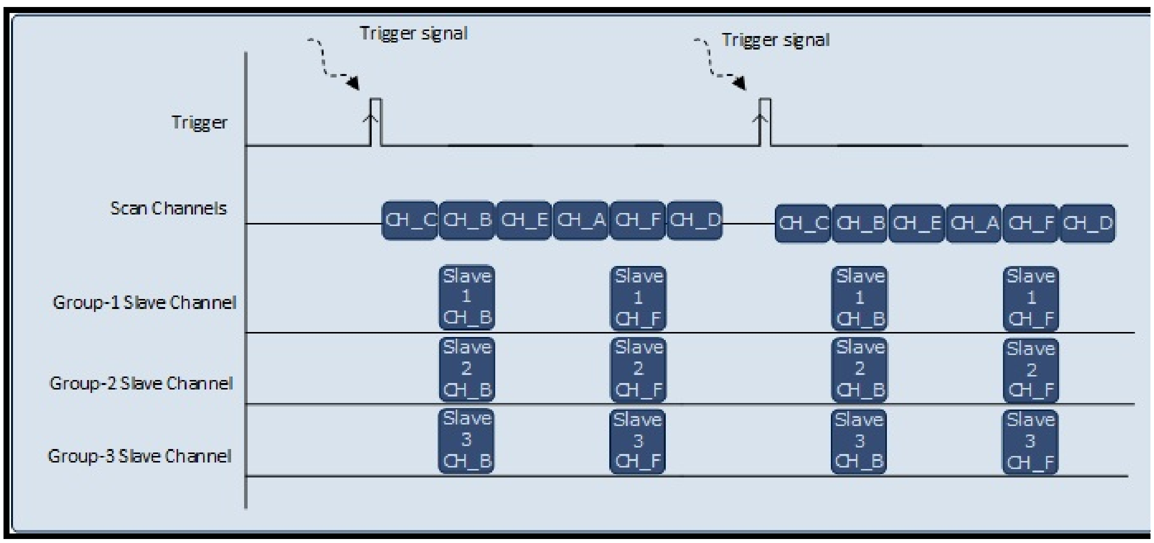


Figure 3 : Sync conversion with scan request source

5. **Result processing:**

   The APP supports result post processing in the hardware. The post processing options can be selected from the APP GUI tab "Post Processing". The options for post processing include the following options:
   - FIFO buffer

This allows up to 16 stage FIFO buffer for the selected channel.
- Result filtering
  Allows either FIR filter or IIR filter for filtering of conversion results.
- Result accumulation
  Allows up to 4 accumulations of conversion results.
- Result subtraction
  Subtracts the conversion result by the value stored in the GxRES0 register. The result register is not allocated when this mode is selection.

6. **Limit Checking (Boundary):**

   The APP supports result monitoring with limit checking.
   In normal mode the converted value is automatically checked with two boundary values. If required, a channel event is generated on every result or if the result is inside or outside the boundary.
   In fast compare mode the result is checked with a compare value. In this mode a channel event can be generated if the result is lower or higher the compare value or if the value is crossing the compare value.
   The fast compare mode can be selected in the required APP ADC_SCAN or ADC_QUEUE. Additional for both modes and up to 4 channels a boundary flag is available.
7. **Interrupt Notifications:**

   - Result event:
     A notification or an event is generated when a new valid result is present in the result register
   - Channel event:
     A notification or an event is generated when either a channel has finished its conversion or the channel's converted result is inside/outside the boundary values.
   - Request source interrupt:
     A interrupt is generated when all the channels are converted

once. For a scan request source the interrupt is generated after the least channel number gets converted. For a queue request source the interrupt is generated after a specific entry finishes its conversion.

APP Structure

Figure 4 , shows how the APP is structured in DAVE. XMC controllers provides the VADC module for analog to digital conversion. The XMC Lib layer provides abstraction for these hardware modules. The **ADC_MEASUREMENT_ADV** APP uses VADC and SCU LLDs and other dependent APPS such as ADC_QUEUE, ADC_SCAN, GLOBAL_ADC ,ANALOG_IO and CLOCK_XMCx for the functional execution.

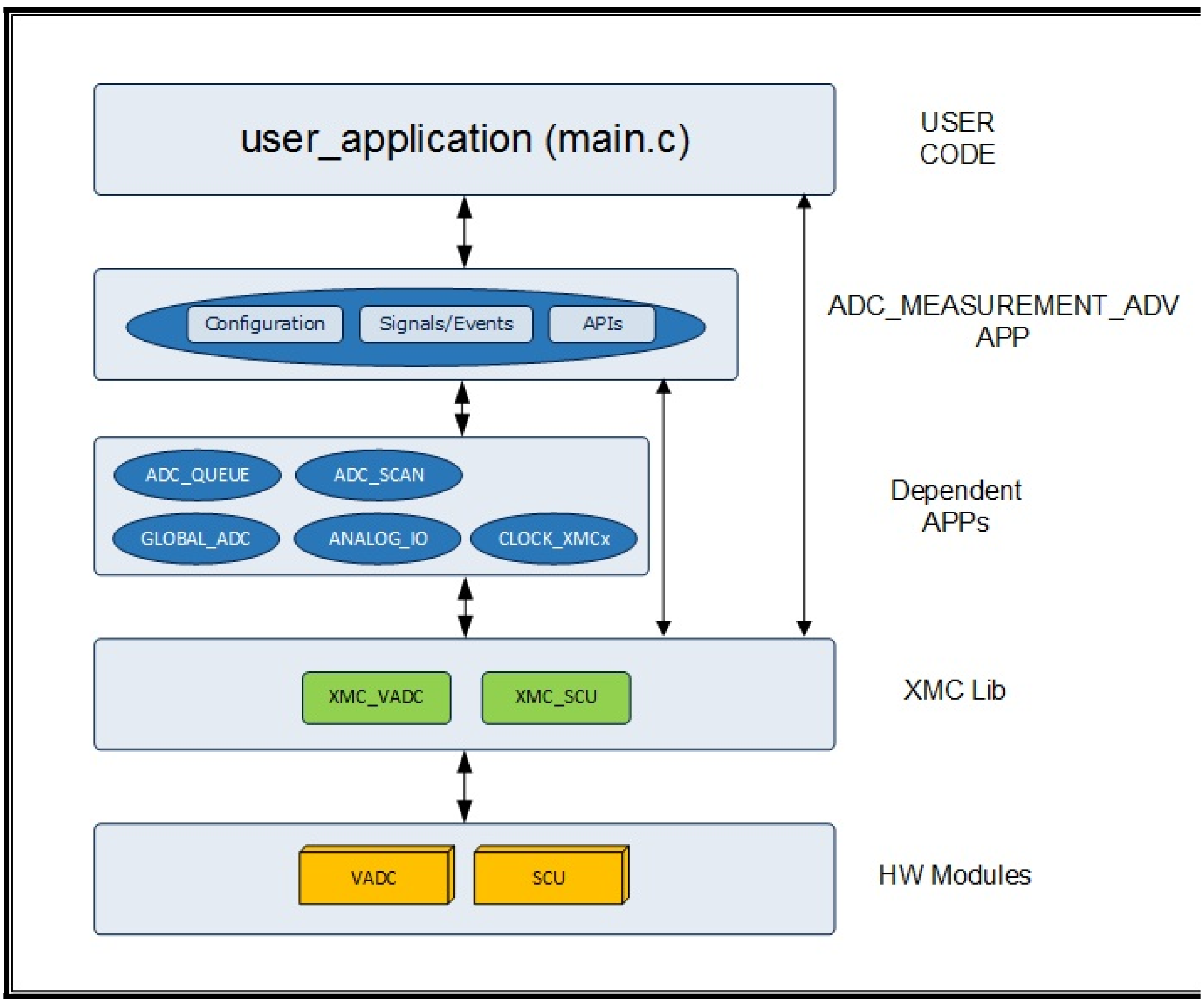


Figure 4 : Hardware and Software connectivity of **ADC_MEASUREMENT_ADV** APP

Limitations:

- Channel events are only supported for boundary channels, hence is limited to maximum 4.
- The sync. slave channel events are not available for signal connection.
- For XMC1x devices when alias feature is used, it causes the gain value to be configured for the source channel and not for the alias channel.

Supported Devices

The APP supports below devices:

1. XMC4800 / XMC4700 Series
2. XMC4500 Series
3. XMC4400 Series
4. XMC4300 Series
5. XMC4200 / XMC4100 Series
6. XMC1400 Series
7. XMC1300 Series
8. XMC1200 Series

Reference

1. XMC4800 / XMC4700 Reference Manual
2. XMC4500 Reference Manual
3. XMC4400 Reference Manual
4. XMC4300 Reference Manual
5. XMC4200 / XMC4100 Reference Manual
6. XMC1400 Reference Manual
7. XMC1300 Reference Manual
8. XMC1200 Reference Manual

ADC_MEASUREMENT_ADV

Architecture Description

Architecture Description

The following diagrams represents the internal software architecture of the **ADC_MEASUREMENT_ADV** APP. The figure shows the consumed hardware resources, dependent APPs and various signals which are exported.

- Figure 1 represents the architecture of the **ADC_MEASUREMENT_ADV** APP with expose APP option enabled in the GUI.
- Figure 2 represents the architecture of the **ADC_MEASUREMENT_ADV** APP with expose APP option disabled in the GUI. This configuration consumes the request source inside **ADC_MEASUREMENT_ADV** itself.

A **ADC_MEASUREMENT_ADV** APP instance exists in a DAVE™ project with fixed attributes as shown and uses the VADC peripheral's scan or queue request source for converting a channel. This in addition requires the consumption of the GLOBAL_ADC and CLOCK APPS for functional configurations. The **ADC_MEASUREMENT_ADV** APP also provides output signals, these are described in Table-1.

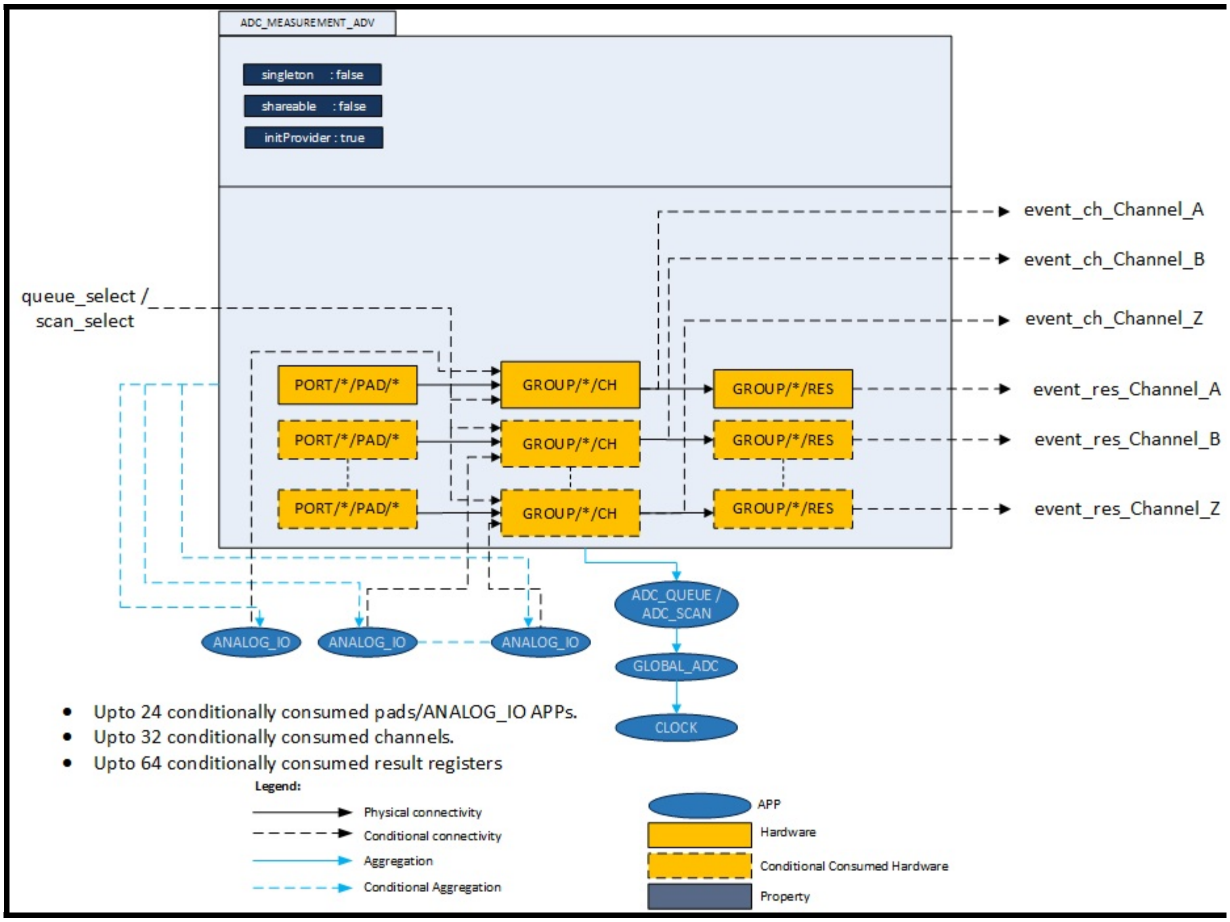


Figure 1 : Architecture of the **ADC_MEASUREMENT_ADV** APP with exposed request source APP.

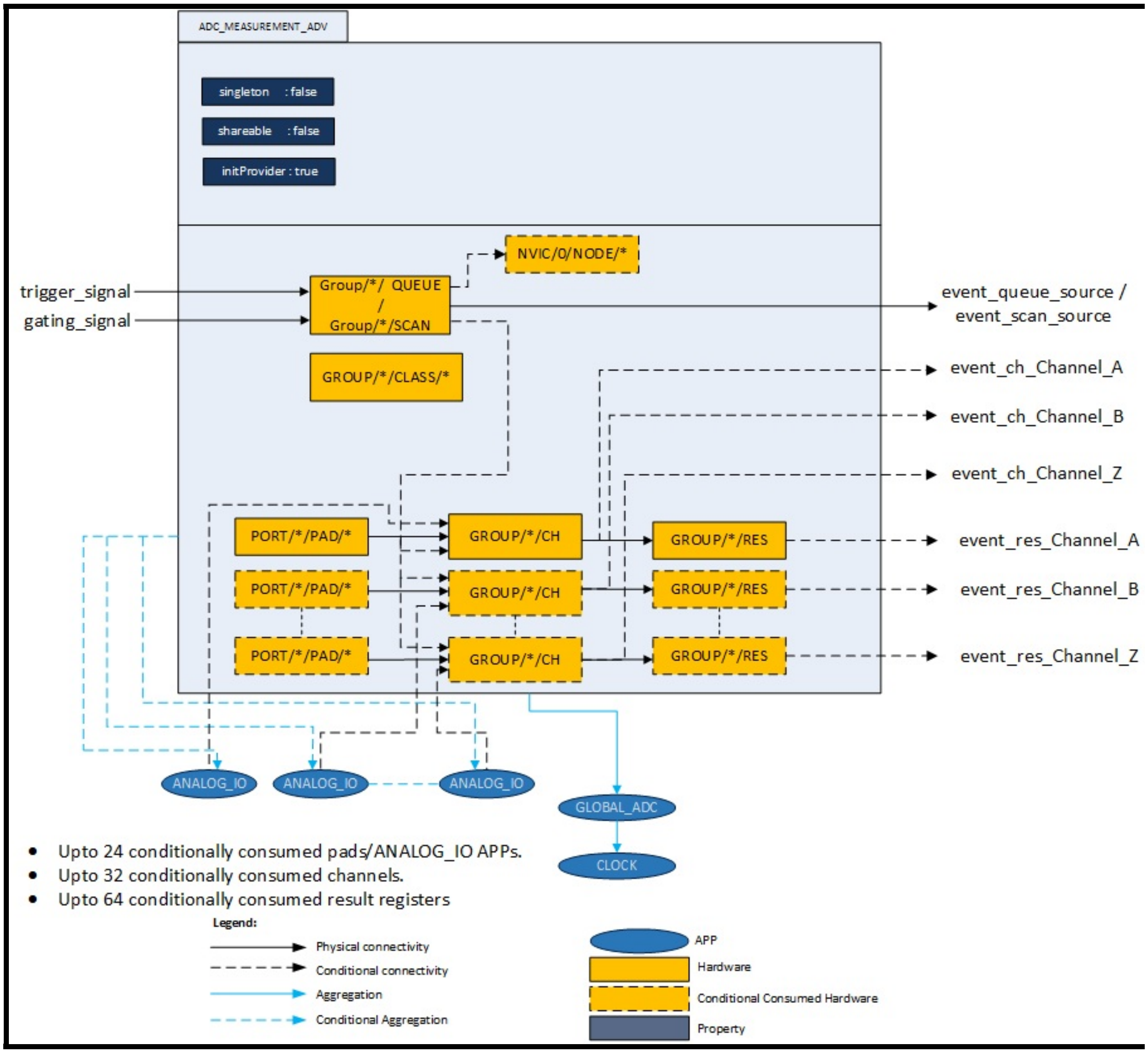


Figure 2 : Architecture of the **ADC_MEASUREMENT_ADV** APP with internally consumed request source.

Following are the features of the **ADC_MEASUREMENT_ADV** APP.

1. **Pin Sharing**
2. **Result Registers**
3. **Interrupt/Event Generation**
4. **Queue Sequencer**
5. **Insert channels**
6. **Sample and Hold Gain Configuration**
7. **Limit checking(Boundary configuration)**

Detailed descriptions are as follows.

1. **Pin Sharing:**

   ANALOG_IO APP is conditionally used by **ADC_MEASUREMENT_ADV** APP when an "Expose pin"" is selected in the UI. This is applicable for all the channels. By using the ANALOG_IO, the **ADC_MEASUREMENT_ADV** can share the pin with other APPs such as DAC, ACMP_CONFIG etc.
   It is possible to connect the same ANALOG_IO APP to multiple channels. This involves the use of the ALIAS feature of the ADC channels. In this the same pin gets converted by multiple channels from the same group.
   For example: Two instances of the **ADC_MEASUREMENT_ADV** are present in the project. In ADC_MEASUREMENT_ADV_0, 3 channels are used from group-0 and in ADC_MEASUREMENT_ADV_1 another 3 channels are used from Group-1. The example is taken with reference to XMC4500. The pins and channels distribution are shown in the following figure.

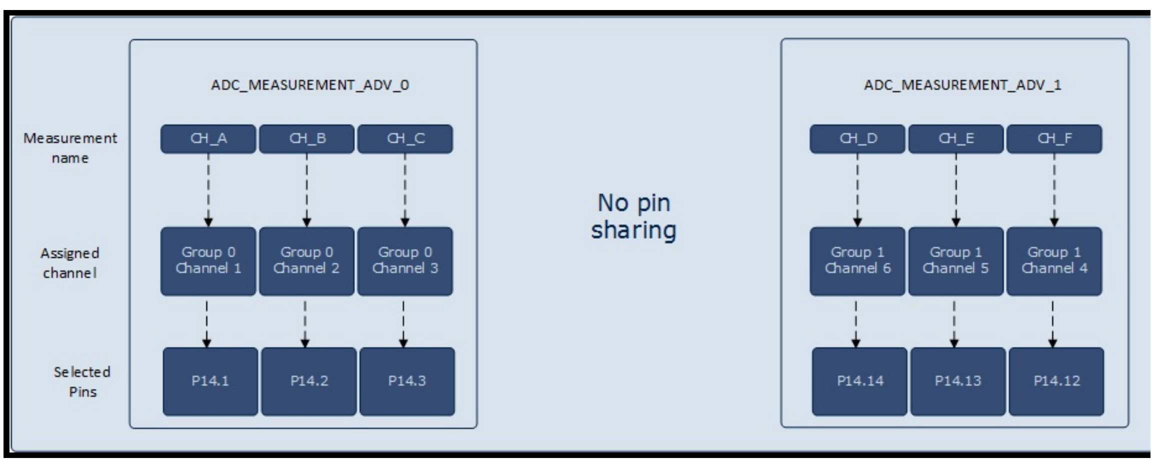


Figure 3 : Pins and channel consumption without ANALOG_IO

   The alias feature of the VADC allows the Channels 0 and 1 to convert any pin available in the same group. In XMC4500 the pin P14.7 is only connected to Channel-7 of Group-0. With the alias feature we can use the Group-0 Channel-0 to convert P14.7.

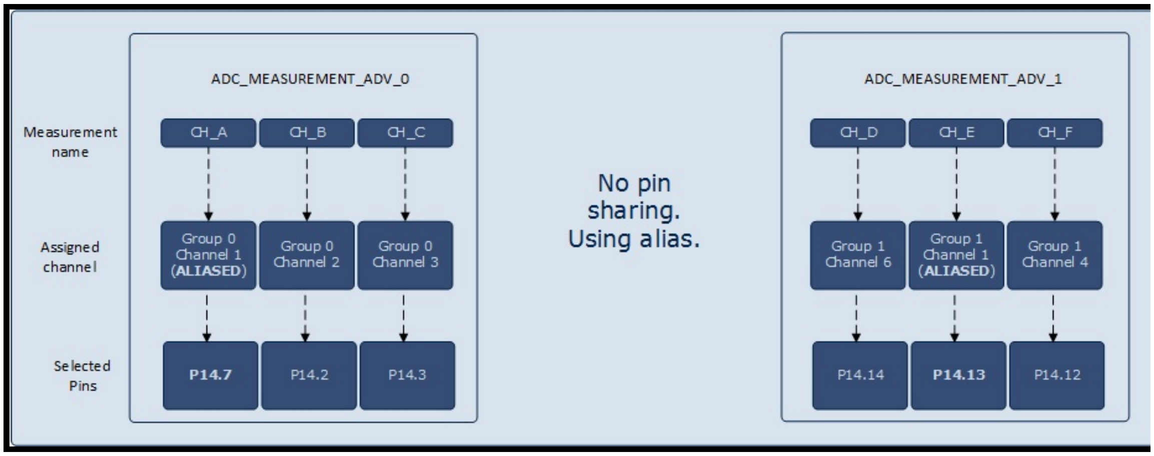


Figure 4 : Pins and channel consumption with alias

The alias feature of the VADC allows the conversion of any given pin of the group by the alias channels Channel-0 or Channel-1. This means that the Channel-0 and Channel-1 can convert not only the pins assigned to it but also the other pins available for the entire group. This feature can be used to convert a pin multiple times. In order to do this a pin must get shared with the other channels as well. This is only possible through the consumption of the ANALOG_IO APP. The following figure depicts how the channel numbers get changed when the same pin is being shared between channels.

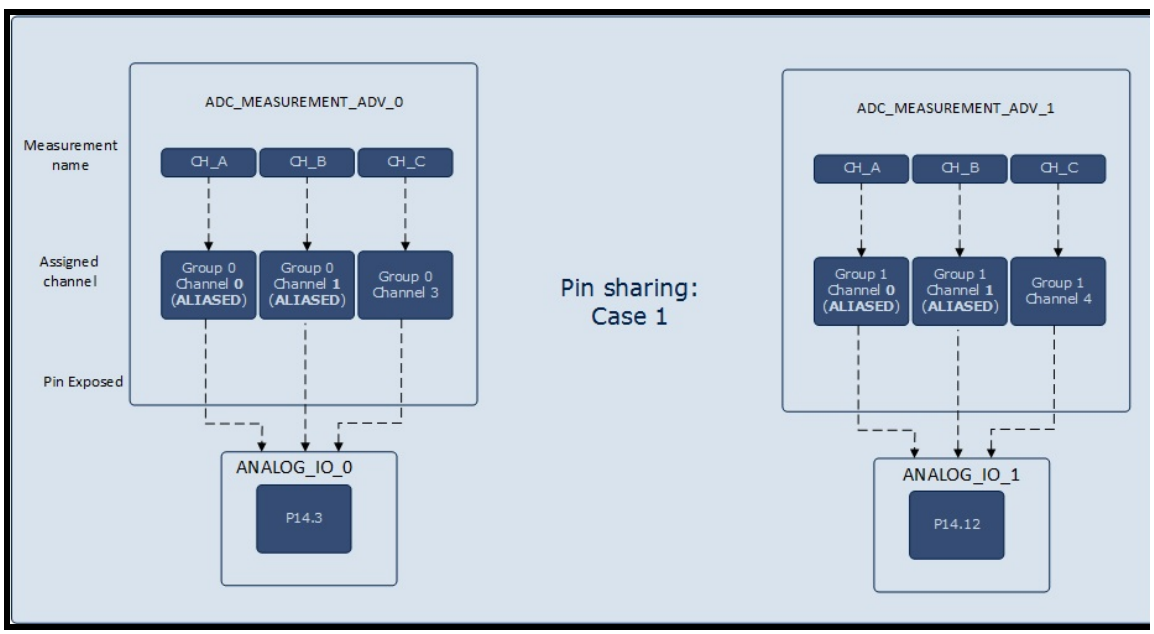


Figure 5 : Pins and channel consumption with ANALOG_IO with a group

In different groups of the VADC the channels can have the same pin number. For example in XMC4500 P14.3 is shared between Group-0 Channel-3 and Group-1 Channel-3. Thus two instances of the **ADC_MEASUREMENT_ADV** APP can convert the same pin. The following figure shows that it is possible to connect the Group-1 Channel-3 to the ANALOG_IO that is consuming P14.3. With the alias feature in the Group-1 is also possible to convert that pin using Group-1 Channel-0 and Group-1 Channel-1.

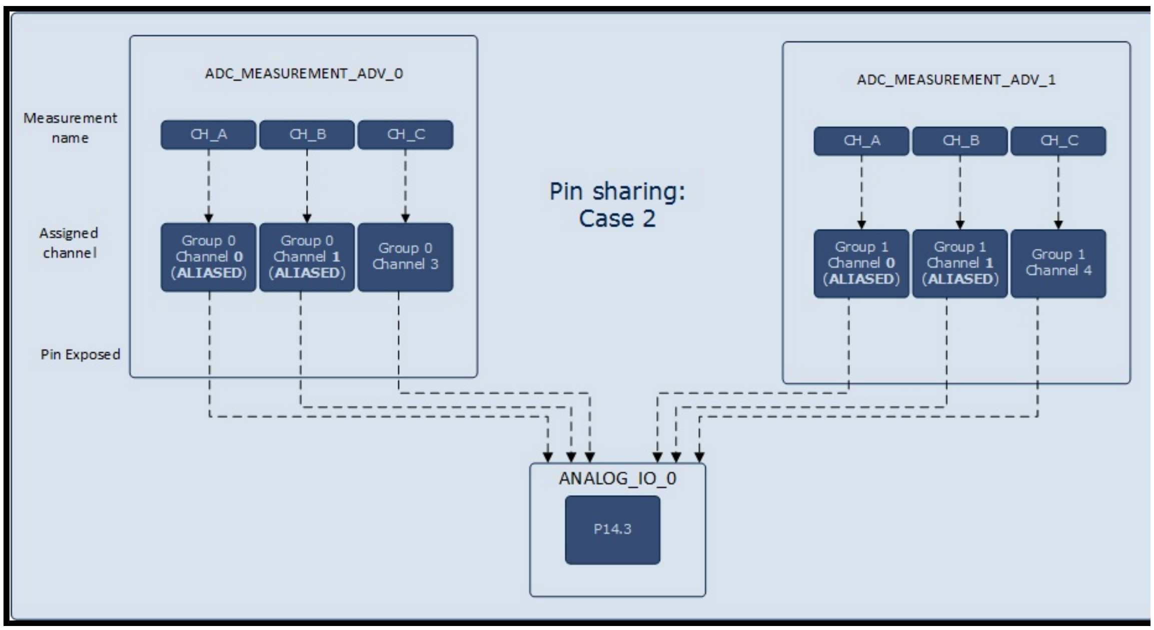


Figure 6 : Pins and channel consumption with ANALOG_IO shared between groups

2. **Result Registers:**

   Each channel is mapped to one result register(excluding FIFO related configuration). There are 3 different categories of result registers based on different functions it provides.

   - **result_adv**: Provide boundary flag outputs.
   - **result_filter**: Provide filtered output.
   - **result**: Provide accumulation(1x, 2x, 3x, 4x)/subtraction mode.

In **ADC_MEASUREMENT_ADV** APP the *result_adv* is used when Boundary is used for Normal Comparison Mode. The *result_filter* is used when result post processing requires Result Filtering Mode .This is either FIR (Finite Impulse Response) or the IIR(Infinite Impulse Response) filters. The *result* is used when ever whenever Standard Data Reduction Mode or Subtraction Mode is selected.

3. **Interrupt/Event Generation:**

   - **Request source interrupt:**

     In the Interrupts TAB the **ADC_MEASUREMENT_ADV** doesn't consume a NVIC node for interrupt. But it uses a callback registration mechanism that is called whenever the request source interrupt is raised. This callback is registered with the request source APP, ADC_QUEUE/ADC_SCAN. The callback is registered in the queue/scan entry by considering the following rules.

     - For queue request source the callback would be registered to the entry that has the "Source event" enabled in the Sequence Plan TAB.
     - For scan request source the callback is registered with the lowest numbered channel number. Since the lowest channel numbered entry is the last channel to get executed in the scan sequence.

   - **Result Event:**

     Receive an event every time a new result is available in the result register. This event has to be enabled in the "Channel Configuration" TAB. To generate an interrupt from this event, connect the result event signal from the **ADC_MEASUREMENT_ADV** APP to INTERRUPT APP using the H/W Signal connections. This setup would provide result interrupts for the channels.

   - **Channel Event:**

This event has to be enabled in the "Boundary Settings" TAB. To enable the channel events, select the channel event combo box for the required channel. To generate an interrupt from this event, connect the result event signal from the **ADC_MEASUREMENT_ADV** APP to INTERRUPT APP using the H/W Signal connections.

In Normal Conversion Mode it is possible to get a channel event only if the converted value is inside/outside the boundary values or on each new result. The boundary values must be configured using the API ADC_MEASUREMENT_ADV_SetBoundary().

In Fast Compare Mode it is possible to get a channel event only if the measured value is above or below a compare value, or if it crosses the compare value. The compare value is located in the result register and must be configured with the API **ADC_MEASUREMENT_ADV_SetFastCompareValue()**

4. **Queue Sequencer:**

   In the Queue sequence it is possible to have a flexible sequence of channels for conversion.

   The "Sequence Plan" allows a flexible configuration of the sequence. Each Channel can be placed on any position. Also multiple selections are allowed. Additional for each position the configurations "Wait for Trigger", "Refill" and "Source Event" are available. With the "Wait for Trigger" "configuration" the queue is waiting for a trigger before the selected channel is converted. The "Refill" option allows a one time measurement. This position is not refilled in the queue and will not execute in the next rounds. The "Source Event" configuration will execute a source event when the conversion is finished.

   The following examples explain the usage of the "Wait for Trigger" and "Refill" configuration.

In the first example the sequence is starting with CH_C. This channel has the configuration "Wait for Trigger" therefore the sequence is waiting for a Trigger before it starts with the conversion of CH_C. No other channel is configured with "Wait for Trigger" therefore the sequence is immediately continuing with the conversion. When the sequence is reaching the end all channels with "Refill" are refilled and the sequence starts again as new. In this case it is waiting again for a trigger.

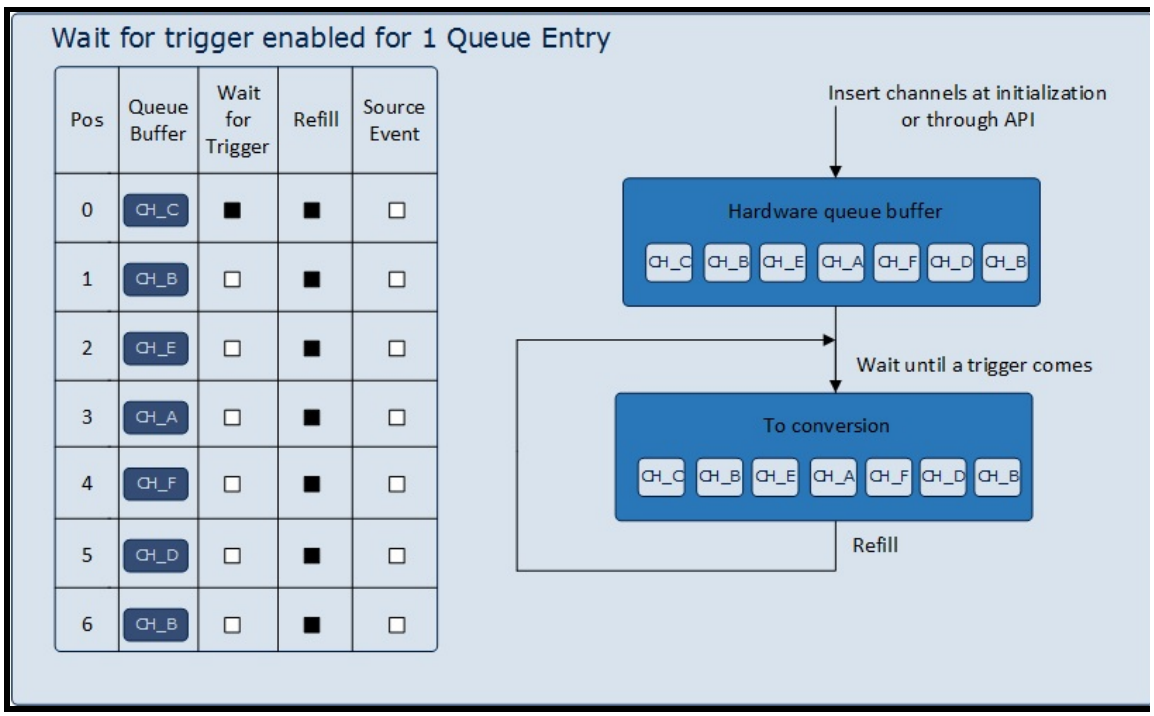


Figure 7 : Queue sequence: Wait for trigger enabled for 1 Queue Entry

In the second example additional CH_A is configured with "Wait for Trigger". This results in a two steps sequence. First the sequence is waiting for a trigger, after this trigger CH_C, CH_B and CH_E are converted. Now the sequence is again waiting for a trigger to continue with CH_A. After a trigger CH_A, CH_F, CH_D and CH_B are converted. Hence all channels provide the configuration "Refill" the sequence is repeated.

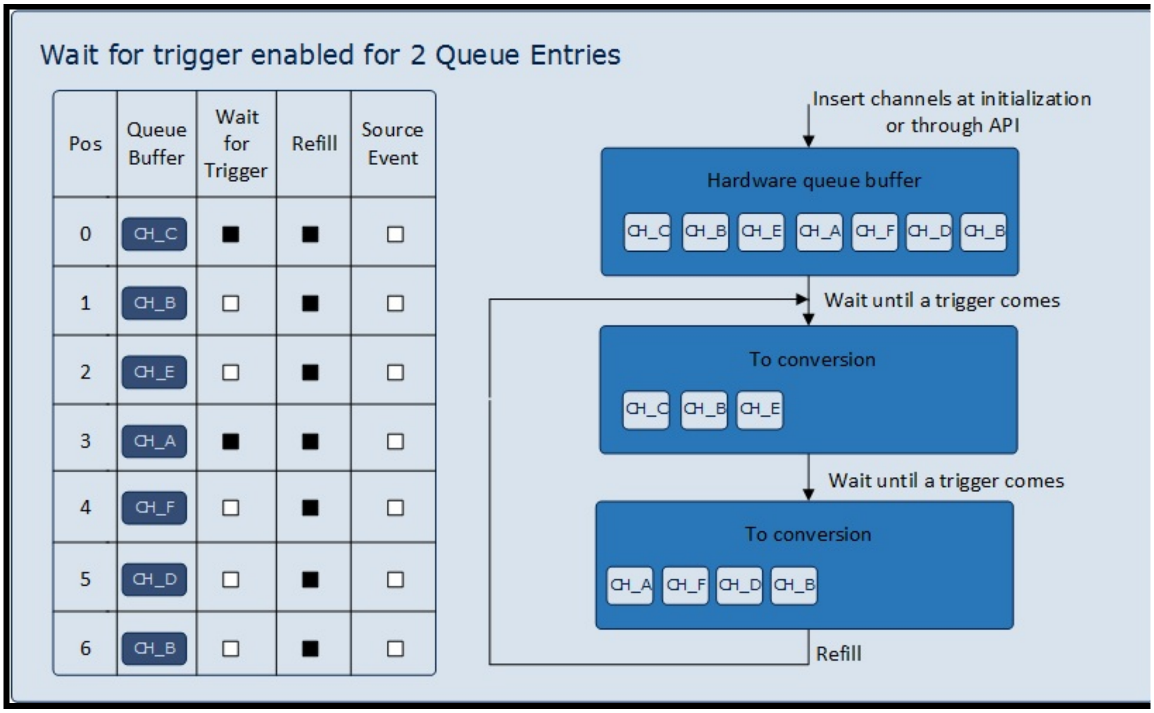


Figure 8 : Queue sequence: Wait for trigger enabled for 2 Queue Entries

In the third example again only CH_C provides a "Wait for Trigger" configuration but know don't has a "Refill" configuration. This means the sequence is waiting for a trigger. After the trigger it start with the conversion of CH_C and continuous with all other channels. At the end of the sequence all channels with "Refill" configuration are refilled. Hence CH_C don't has a "Refill" it will not copied in the sequence. This means after the second round there is no entry with "Wait for Read" and the sequence repeat endless.

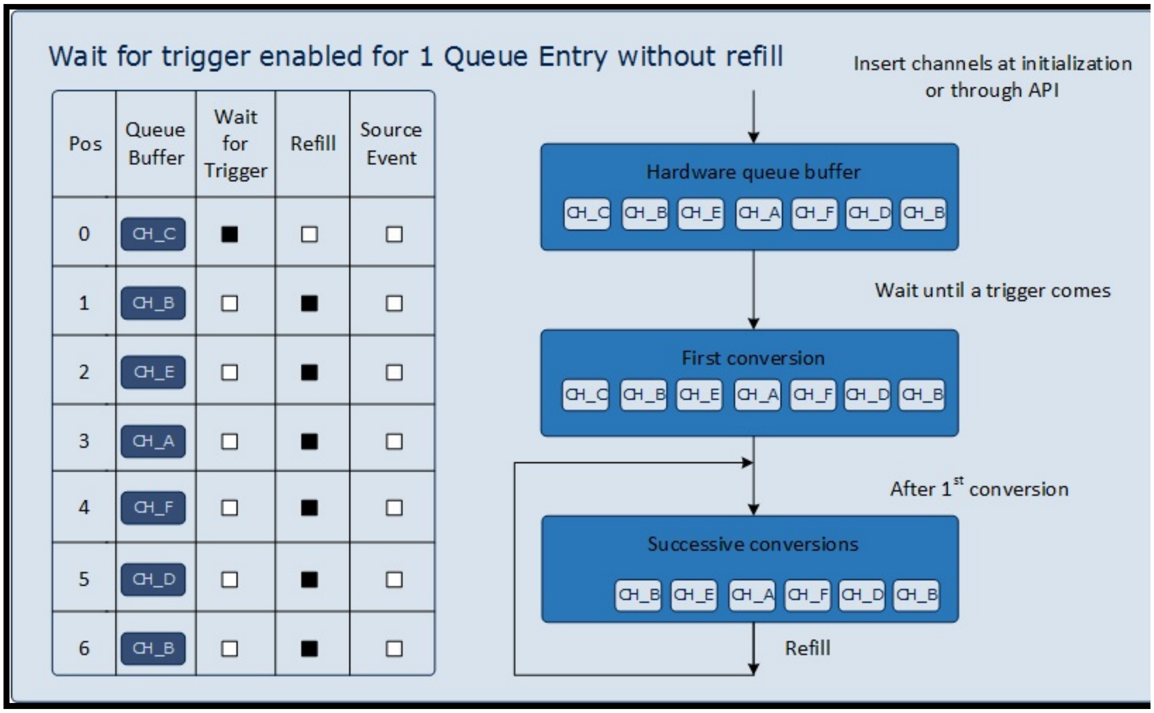


Figure 9 : Queue sequence: Wait for trigger enabled for 1 Queue Entry without refill

5. **Insert channels :**

The insert operation in **ADC_MEASUREMENT_ADV** binds the channels to the selected request source in the hardware.
Since the ADC_QUEUE is shared it is possible to assign the same queue position from other instances of **ADC_MEASUREMENT_ADV** (or from other APPs). In order to prevent such operations, a MACRO is constructed with the following format.
VADC_QUEUE_GROUP_*<group_number>*_POSITION_*<position*
.
This would prevent the APPs that are sharing the ADC_QUEUE APP from trying to push a queue entry into the same location. If the same position is used a error message is displayed. If such a error message is received then the queue sequence needs to be modified appropriately in the GUI.

- **ADC_QUEUE**

When a ADC_MEASUREMENT_ADV_InsertChannels() API is invoked or the GUI check box "Insert channels at initialization" is enabled with the "Wait for Trigger", the channels will wait until a trigger event occurs. A trigger event can be either a ADC_MEASUREMENT_ADV_StartConversion() or an external trigger edge. When a trigger event occurs the particular channel will go for conversion.
When a ADC_MEASUREMENT_ADV_InsertChannels() API is invoked or the GUI check box "Insert channels at initialization" is enabled without the "Wait for Trigger", The channel being inserted will get converted immediately. And if the refill is enabled for the channel then it will continuously keep converting.

- **ADC_SCAN**

  When a ADC_MEASUREMENT_ADV_InsertChannels() API is invoked or the GUI check box "Insert channels at initialization" is enabled, the channels will be inserted into the hardware. There these channels will continue to wait until a trigger event occurs. A trigger event can be either a ADC_MEASUREMENT_ADV_StartConversion() or an external trigger edge. The trigger event will make all the channels to go for conversion. When all the channels are converted it will go back to wait state when "continuous conversion" is disabled. If "Continuous conversion" is enabled the last channel to get converted will trigger all the channels to get converted again.

6. **Sample and Hold Gain Configuration:**

   The gain related configuration is applicable for only the XMC1x series. This feature allows the input signal to be amplified by the required factor. The gain values can be selected in the GUI for the required channel or by invoking the API **ADC_MEASUREMENT_ADV_SetChannelGain()**. The following example explains how the gain is configured when alias feature is used. The following figure explains the gain configuration by taking

3 channels as an example. The configuration is as follows, CH_A is Group-0 Channel-3, CH_B and CH_C are the alias channels which consume group-0 channel-0 and group-0 channel-1. CH_A and CH_B need gain of 1:1 and CH_C needs 1:3 as the gain ratio. The source channel in this case is Group-0 Channel-3 and the source pin is P14.3 and the other 2 are aliased to this channel. When alias feature is used and gain configuration is needed for the alias channel it is necessary to configure the gain of the source channel rather than the gain of the alias channel. In this example in-order to configure the gain for the CH_C it is necessary to configure the gain in the source channel i.e. group-0 channel-3. Due to such a configuration of the SHS the CH_A and CH_B would also convert with a gain factor of 1:3.

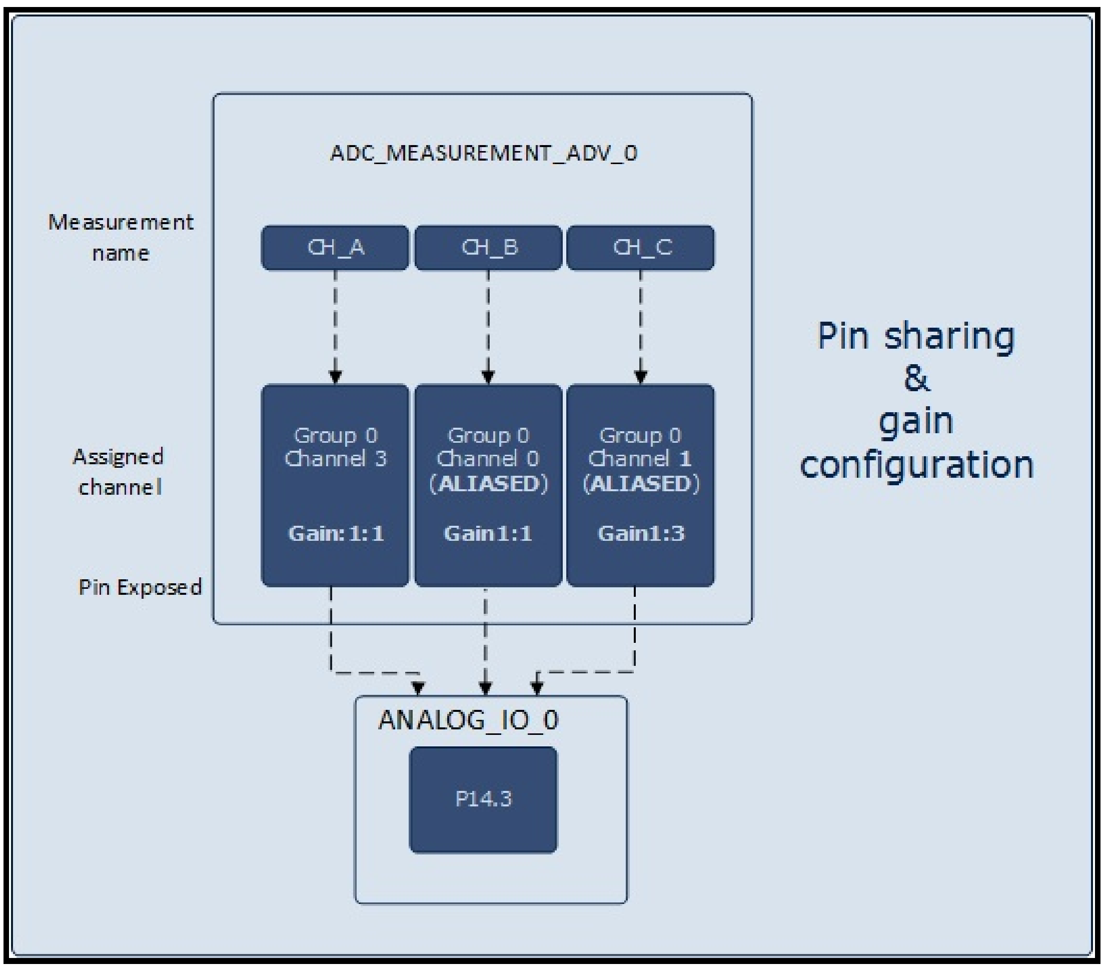


Figure 10 : Sample and Hold gain configuration example with alias enabled

7. **Limit checking(Boundary configuration):**

   The Limit checking can automatically compare each conversion to an upper or lower bound values. Accordingly a channel event can be triggered if the result is inside/outside the user-defined band. This limit checking can only be done by specific registers with boundary being configured in GxBOUND or GLOBBOUND. In XMC45 device the limit checking can be done the first 4 channels in each group and in all the other devices the limit checking is done by the first 4 result registers in each group. Hence in the UI the boundary configuration is limited to only 4.

   The Boundary values can only be configured by invoking the API **ADC_MEASUREMENT_ADV_SetBoundaryUpper()** and **ADC_MEASUREMENT_ADV_SetBoundaryLower()**. These API would configure the respective boundary registers mentioned in the "Boundary Settings" Tab in APP's GUI.

   Note: The value to be configured in the boundary registers have to be left aligned compare values. For example, a compare value in 10 bit resolution is 500 in order to configure this in the boundary registers it has to be first left aligned(left alignment is done by left shift operation). After the left shift operation the resulting value is 2000 this value has to be passed as an argument into the **ADC_MEASUREMENT_ADV_SetBoundaryUpper()** or **ADC_MEASUREMENT_ADV_SetBoundaryLower()** API.

Signals:

The following table provides all APP signals for connection.

Table 1: APP IO signals

Signal Name	Input/Output	Availability	Descript
			Result event

event_res_*channel_x* Where *channel_x* represents the channels that are being used.	Output	Unconditional	*channel_x*: ◦ It can b connect INTERF APP to generat interrup the resu generat a particu *channel* ◦ The res event is availabl the che in the U "Result for the particula channel enabled ◦ The *channel* can be configur the "Ch Configu Tab of t APP GU
			Channel eve *channel_x*: ◦ It can b connect INTERF APP. ◦ The cha event is

event_ch_*channel_x* Where *channel_x* represents the channels that are being used.	Output	Unconditional	availabl the com box sele in the U "Bounda Settings the part channel enabled ◦ The lab *channel* can be configu the "Ch Configu Tab of th APP GU
bound_fl_*channel_x* Where *channel_x* represents the channels that are being used.	Output	Conditional	Boundary fla output for *channel_x*: ◦ It can be connect other periphe like CCU POSIF etc. ◦ The bou flag sign availabl when th combo b selectio the UI "Bounda Settings the part

			channel enabled ◦ The label *channel* can be configur the "Ch Configu Tab of th APP GU
*channel_x*_input Where *channel_x* represents the channels that are being exposed.	Input	Conditional	Input connec from ANALO APP pin to g channel: ◦ The pin channel connect visible o when "Expose option is selected channel configur under "Channe Configu TAB". ◦ The Exp option a the pin t shared between periphe ◦ The labe *channel* can be

			configur the "Cha Configu Tab of th APP GU
*channel_x*_slave*y*_input Where *channel_x* represents the slave channels that are being exposed.	Input	Conditional	Input connec from ANALC APP pin to s group chann ◦ The pin channel connect visible c when "Expose option is selectec synchro channel configur under "Chann Configu TAB". ◦ The Exp option a the pin t shared betweer periphe ◦ The labe *channel* can be configur the "Cha Configu

			Tab of tl APP GU
*channel_x*_sel Where *channel_x* represents the channels that are being used.	Input	Unconditional	Input connec from request source APP (ADC_SCAN ADC_QUEU channel: ◦ It select particula group channel establis connect from gro request source t selected channel ◦ The labe *channel* can be configur the "Cha Configu Tab of tl APP GU

Timing Calculations:
ADC_MEASUREMENT_ADV APP uses the following equations to calculate the sample time and Total conversion time.
Refer the reference manual for the detailed information.

1. **Total Conversion time: XMC4000 devices**

Note: PC value is configured as 2 i.e with post calibration always enabled.
If post calibration is disabled (in GLOBAL_ADC APP), the total conversion time will be reduced by 2/fADC (GLOBAL_ADC APP).

1. **Sample Time:**

```
Actual Sample Time = (2 + STC) * tADCI
where,
STC   : Sample time control (Value - 0 to 256)
fADCI : Analog clock frequency
tADCI = 1/fADCI
```

2. **Standard Conversion Mode:**

```
Total Conversion time =  (2 + STC + N + DM + PC) * tAD(
Where,
N       = 8, 10, 12 for n bit resolution.
tADC    = ADC module clock = system clock
tADCI   = Analog clock
STC     = Sample time control (Value - 0 to 256)
DM      = The selected duration of the MSB conversion (
PC      = The post-calibration time PC, if selected (P(
```

3. **Fast Compare Mode:**

```
Total Conversion time = (2 + STC + 2) * tADCI + 2 * tAI
Where,
tADC    = ADC module clock = system clock
tADCI   = Analog clock
STC     = Sample time control (Value - 0 to 256)
```

2. **Total Conversion time: XMC1000 devices**
   - "Total conversion time" for XMC1400/XMC1300/XMC1200 devices are calculated with post calibration.

1. **Sample Time:**
   Minimum sample time is calculated to in accordance with Errata ADC_AI.H007. To ensure proper operation of the internal control logic, tS must be at least four cycles of the prescaled converter clock fSH, i.e. tS >= 4 tCONV x

(DIVS+1).

```
Actual Sample Time(tS) = (2 + STC) * tADCI
where,
STC   : Sample time control (Value - 0 to 256)
fADCI : Analog clock frequency
tADCI = 1/fADCI
```

2. **Standard Conversion Mode:**

```
Total Conversion time = ( 2 + STC) * tADCI + (4 * tSH)
Where,
N       = 8, 10, 12 for n bit resolution.
tSH     = Sample and Hold clock (Converter clock time p
tADC    = ADC module clock = system clock
tADCI   = Analog clock
STC     = Sample time control (Value - 0 to 256)

tSH = tCONV * (DIVS + 1)
Where,
tSH     = Sample and Hold clock (Converter clock time p
tCONV   = Converter clock time period (SHS Clock).
DIVS   = Divider Factor for the SHS Clock
```

3. **Fast Compare Mode:**

```
Total Conversion time = (FCRT + 1) * 2 * tADCI + ( 2 +
Where,
FCRT    = Fast Compare Mode Response Time (Value - 0 to
tSH     = Sample and Hold clock (Converter clock time p
tADCI    = Analog clock
STC     = Sample time control (Value - 0 to 256)
Note: FCRT value is configured as 0.
```

ADC_MEASUREMENT_ADV

Home

APP Configuration Parameters

App Configuration Parameters

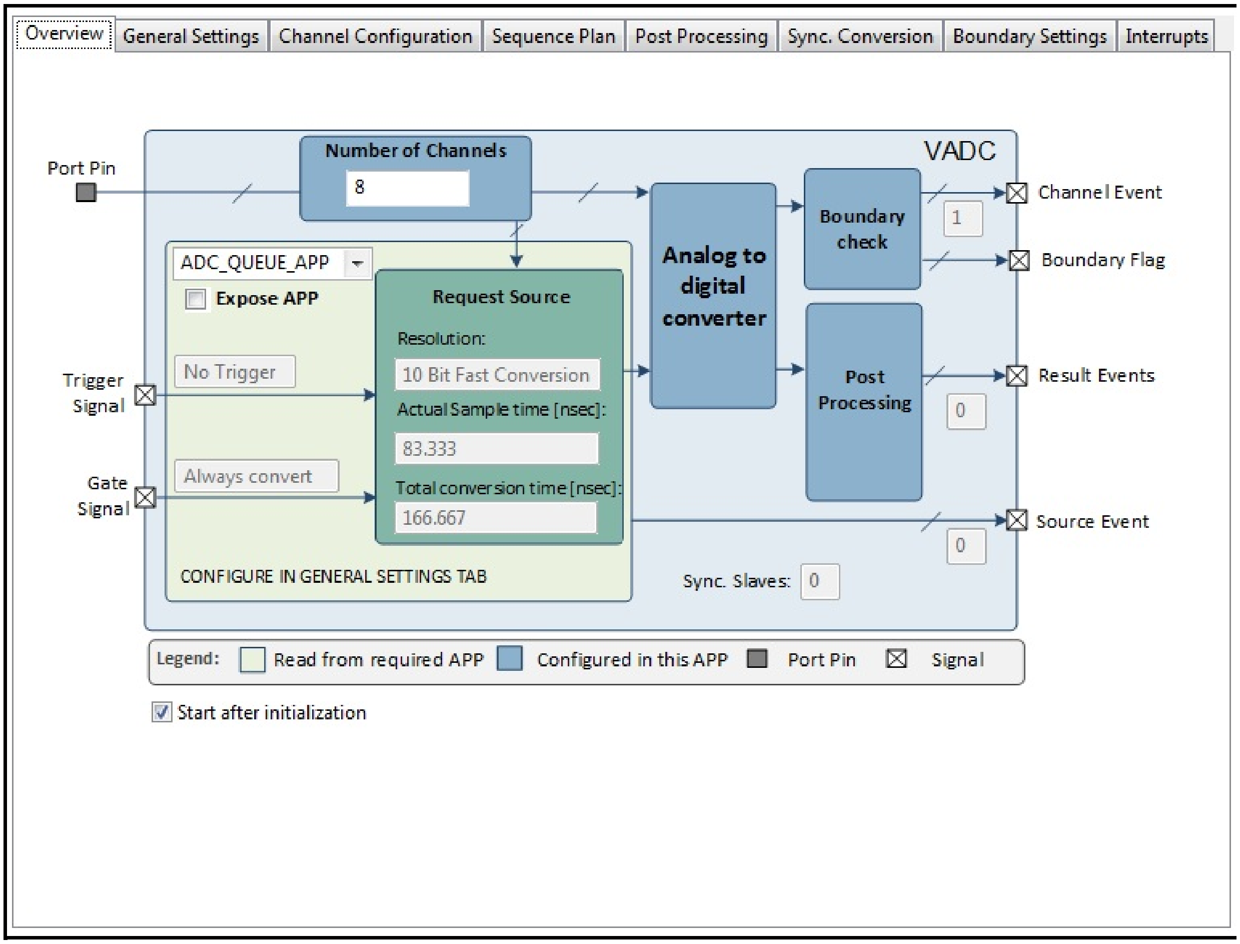


Figure 1: Overview

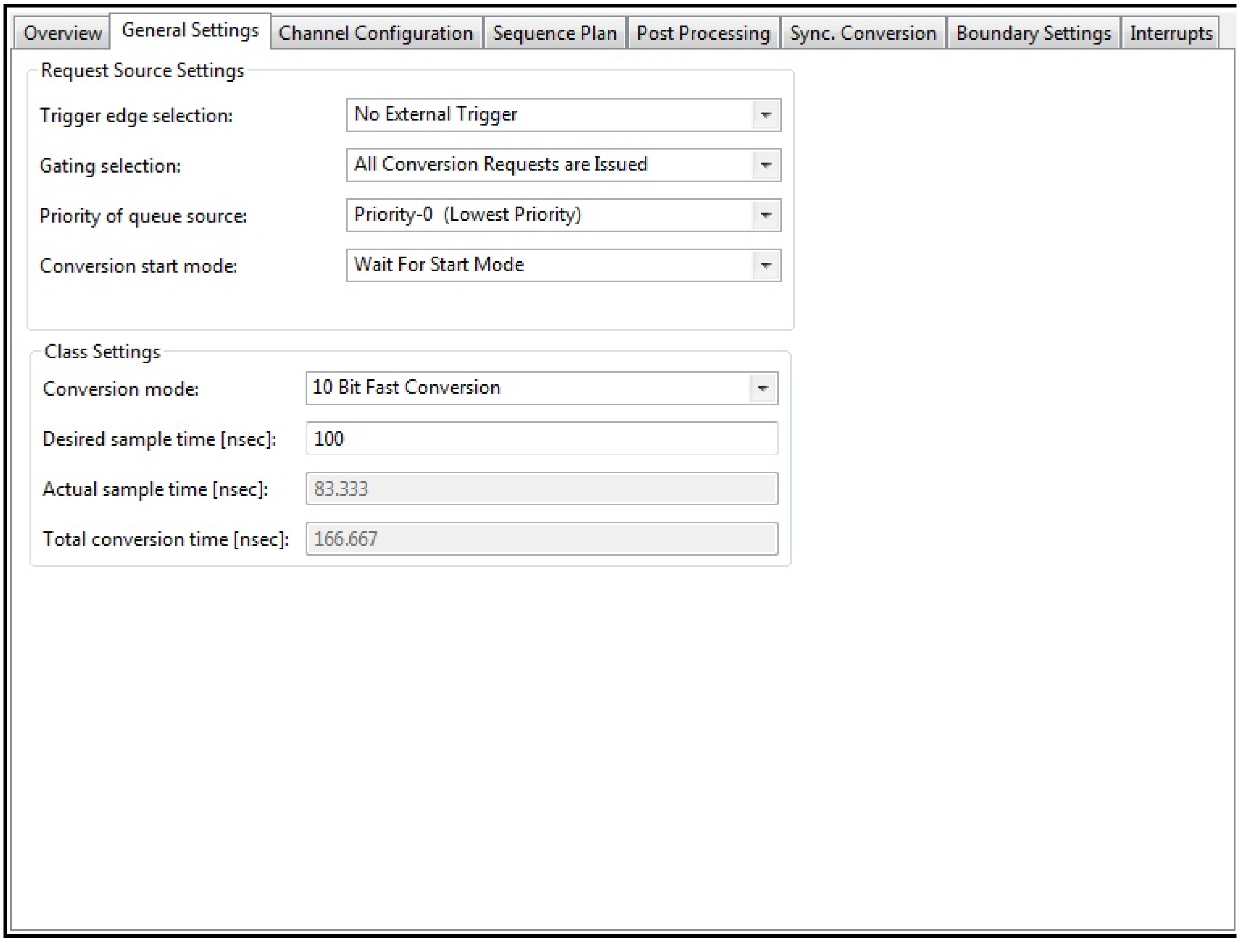


Figure 2: General Settings

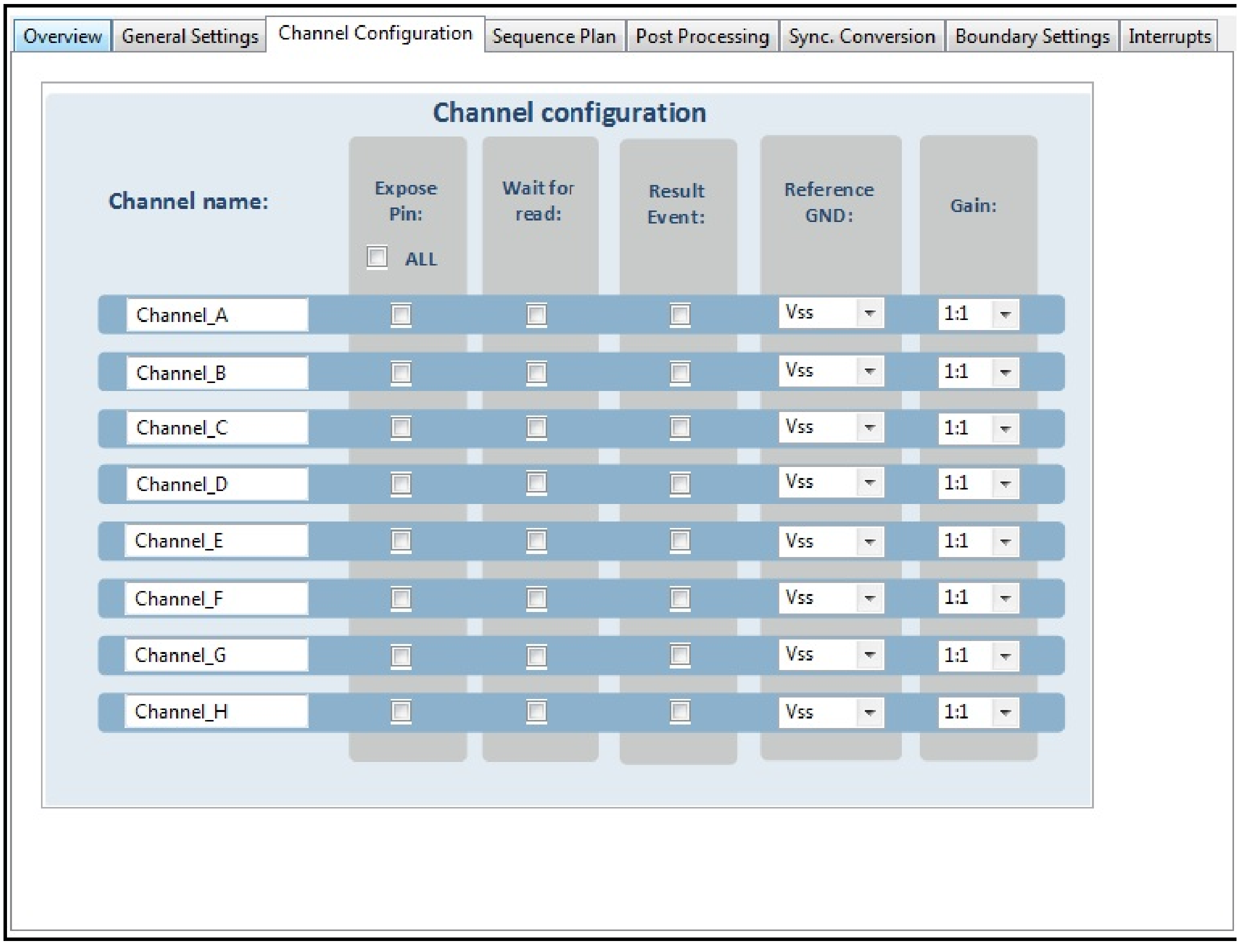


Figure 3: Channel Configuration

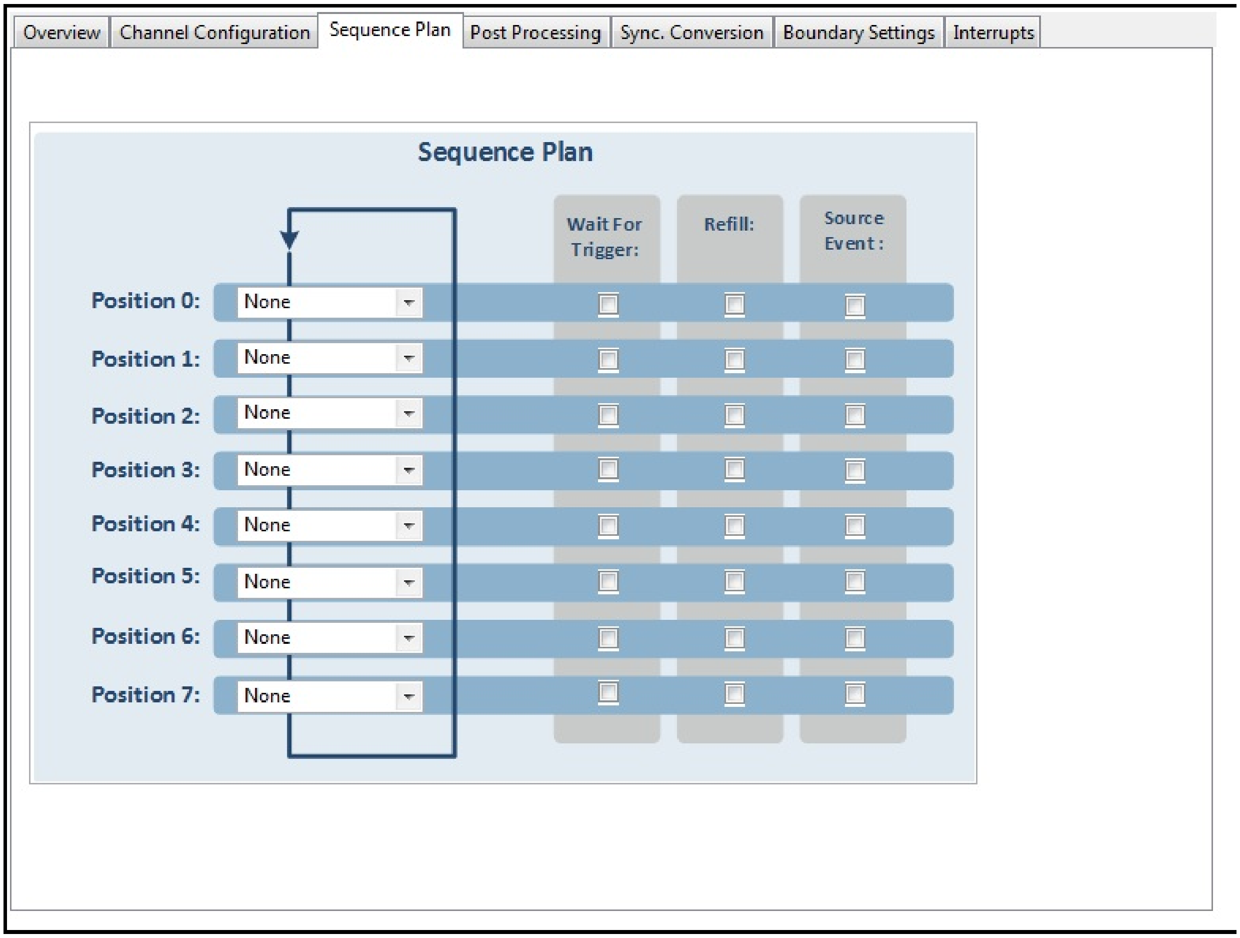


Figure 4: Sequence Plan

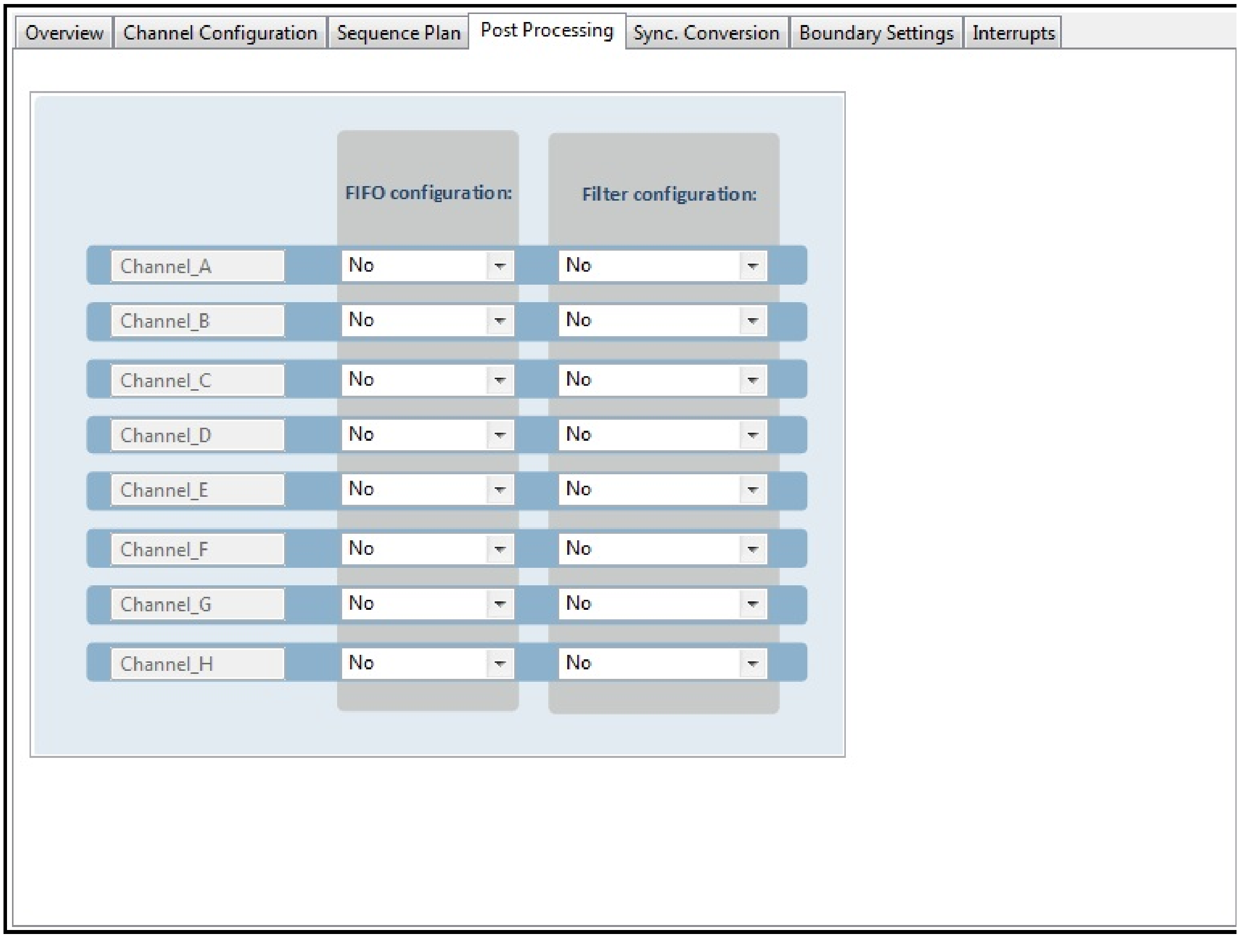


Figure 5: Post Processing

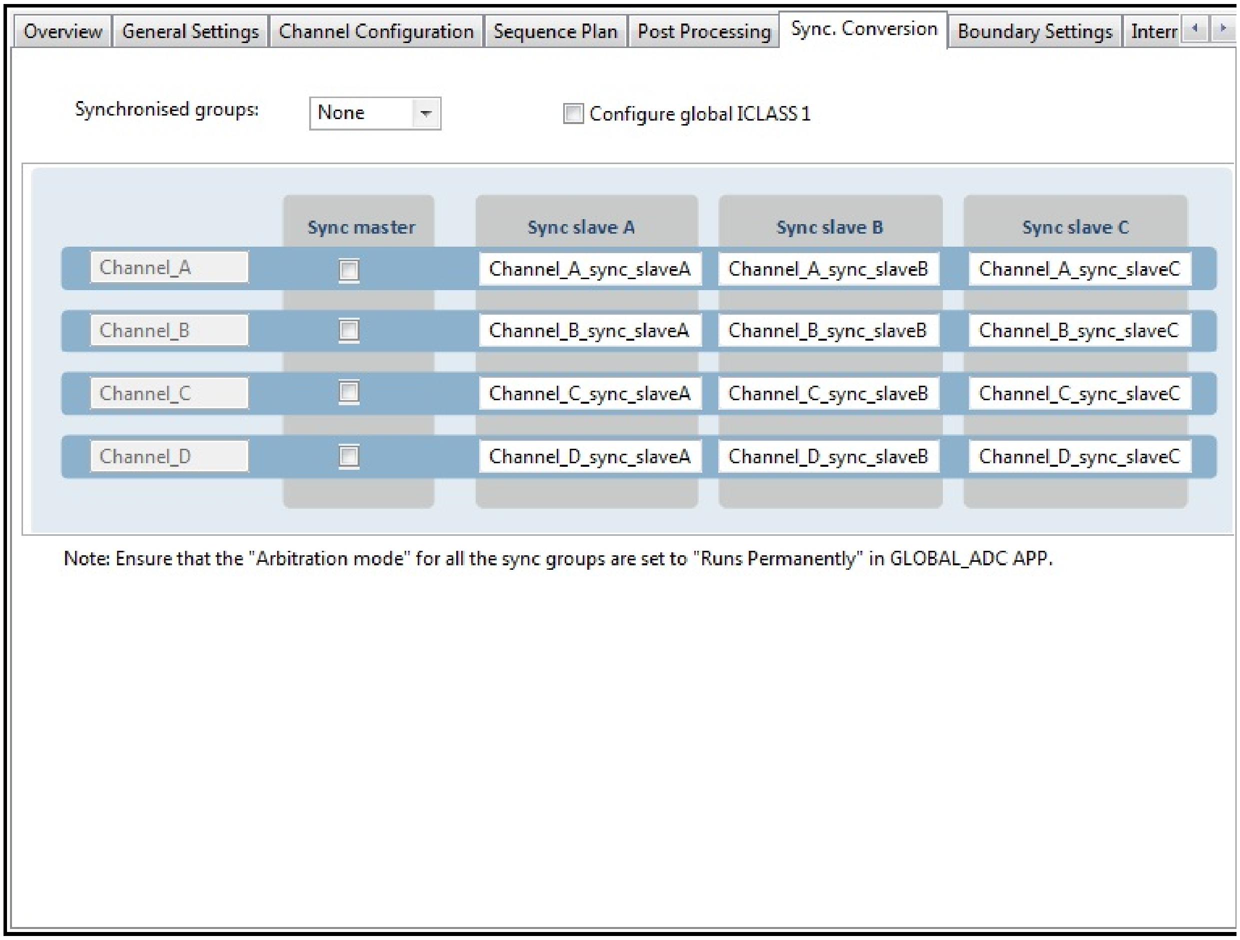


Figure 6: Sync. Conversion

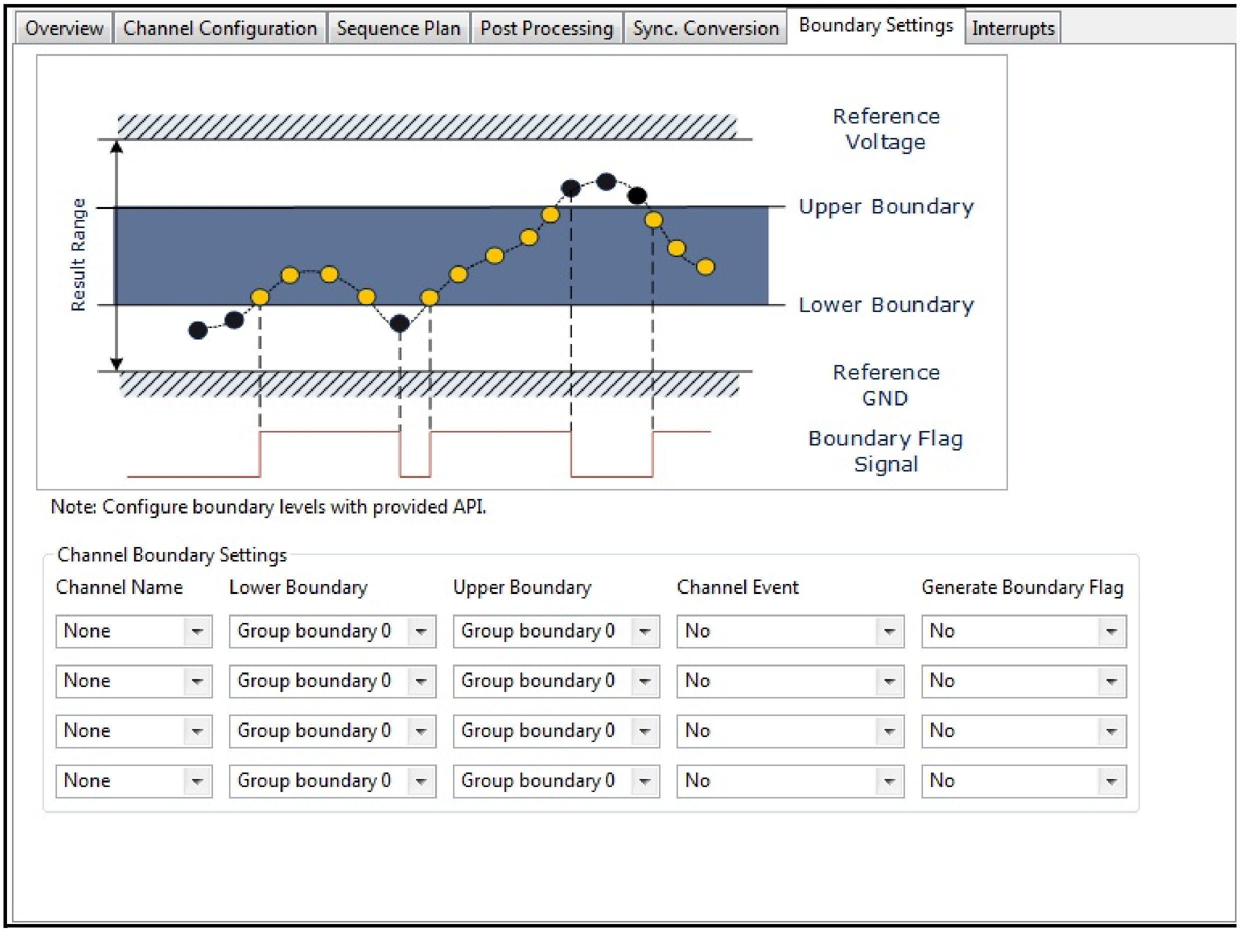


Figure 7: Boundary Settings

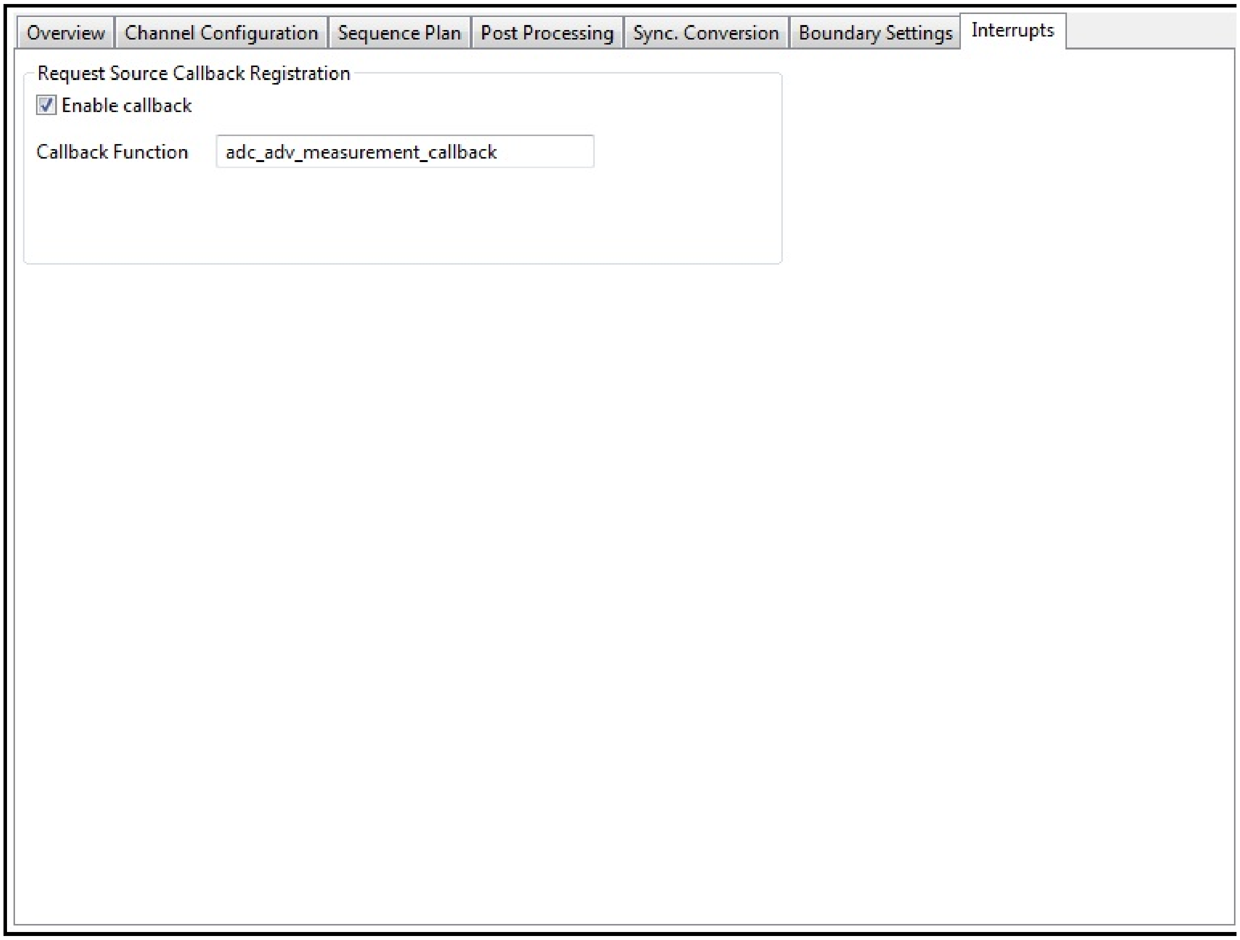


Figure 8: Interrupts

ADC_MEASUREMENT_ADV

Enumerations

enum	ADC_MEASURE ADC_MEASURE ADC_MEASURE ADC_MEASURE Return value of a
enum	ADC_MEASURE **ADC_MEASURE** **ADC_MEASURE** **ADC_MEASURE** **ADC_MEASURE** } The selected Rec
enum	ADC_MEASURE **ADC_MEASURE** **ADC_MEASURE** **ADC_MEASURE** **ADC_MEASURE** The gain applied
enum	ADC_MEASURE **ADC_MEASUR** = 0U, **ADC_MEASURE** = 0U, **ADC_MEASURE** 2U, **ADC_MEASURE** = 0U, **ADC_MEASUR** 4U,

	ADC_MEASURE 0U } Alignment option
enum	**ADC_MEASURE** **ADC_MEASURE** **ADC_MEASURE** **ADC_MEASURE** The result of the
enum	**ADC_MEASURE** **ADC_MEASURE** **ADC_MEASURE** **ADC_MEASURE** The result of the
typedef enum **ADC_MEASUREMENT_ADV_STATUS**	**ADC_MEASURE** Return value of a
typedef enum **ADC_MEASUREMENT_ADV_REQUEST_SOURCE**	**ADC_MEASURE** The selected Rec
typedef enum **ADC_MEASUREMENT_ADV_GAIN**	**ADC_MEASURE** The gain applied
typedef enum **ADC_MEASUREMENT_ADV_SUBTRATION**	**ADC_MEASURE** Alignment option
typedef enum **ADC_MEASUREMENT_ADV_FAST_COMPARE**	**ADC_MEASURE** The result of the
typedef enum **ADC_MEASUREMENT_ADV_SYNC_SEQ**	**ADC_MEASURE** The result of the

Enumeration Type Documentation

enum ADC_MEASUREMENT_ADV_STATUS

Return value of an API.

Enumerator:

ADC_MEASUREMENT_ADV_STATUS_SUCCESS	The API call is success
ADC_MEASUREMENT_ADV_STATUS_FAILURE	The API call is failed
ADC_MEASUREMENT_ADV_STATUS_UNINITIALIZED	APP has not been Initialize

Definition at line **107** of file **ADC_MEASUREMENT_ADV.h**.

ADC_MEASUREMENT_ADV

Home

Data structures

typedef void(*	ADC_MEASUREMENT)(void)
typedef struct ADC_MEASUREMENT_ADV_NVIC_CONFIG	ADC_MEASUREMENT NVIC Configuration stru interrupt.
typedef struct ADC_MEASUREMENT_ADV_SCAN	ADC_MEASUREMENT Configuration Data stru source.
typedef struct ADC_MEASUREMENT_ADV_QUEUE	ADC_MEASUREMENT Configuration Data stru source.
typedef struct ADC_MEASUREMENT_ADV_CHANNEL	ADC_MEASUREMENT
typedef struct ADC_MEASUREMENT_ADV	ADC_MEASUREMENT

Typedef Documentation

typedef struct ADC_MEASUREMENT_ADV_CHANNEL ADC_MEASU

Structure to configure the channels in the **ADC_MEASUREMENT_ADV** APP.

typedef void(* ADC_MEASUREMENT_ADV_EVENT_CONFIG_t)(voi

Function pointer to the mux configuration

Definition at line **190** of file **ADC_MEASUREMENT_ADV.h**.

typedef struct ADC_MEASUREMENT_ADV ADC_MEASUREMENT_

Structure to configure **ADC_MEASUREMENT_ADV** APP.

ADC_MEASUREMENT_ADV

Methods

DAVE_APP_VERSION_t	**ADC_MEASUREM** Get **ADC_MEASU**
void	**ADC_MEASUREM** **ADC_MEASUREM** Starts the VADC re
void	**ADC_MEASUREM** **ADC_MEASUREM** Starts the conversi
ADC_MEASUREMENT_ADV_STATUS_t	**ADC_MEASUREM** **ADC_MEASUREM** Initializes the **ADC** Instance.
__STATIC_INLINE uint16_t	**ADC_MEASUREM** **ADC_MEASUREM** handle_ptr) Returns the conve
__STATIC_INLINE XMC_VADC_DETAILED_RESULT_t	**ADC_MEASUREM** (const **ADC_MEAS** *const handle_ptr) Returns the compl
__STATIC_INLINE uint16_t	**ADC_MEASUREM** **ADC_MEASUREM** handle_ptr) Returns the conve
__STATIC_INLINE XMC_VADC_DETAILED_RESULT_t	**ADC_MEASUREM** (const **ADC_MEAS** *const handle_ptr) Returns the compl

__STATIC_INLINE **ADC_MEASUREMENT_ADV_FAST_COMPARE_t**	**ADC_MEASUREM** (const **ADC_MEAS** *const handle_ptr) Returns the result
ADC_MEASUREMENT_ADV_STATUS_t	**ADC_MEASUREM** (const **ADC_MEAS** *const handle_ptr, Sets the fast conve
void	**ADC_MEASUREM** (const **ADC_MEAS** handle_ptr, **ADC_MEASUREM** subtraction_alignm Set the subtraction required.
void	**ADC_MEASUREM** (const **ADC_MEAS** *const handle_ptr, XMC_VADC_GRO Configures the inpu time).
void	**ADC_MEASUREM** (const **ADC_MEAS** *const handle_ptr, XMC_VADC_CHA Selects alternate re
void	**ADC_MEASUREM** **ADC_MEASUREM** handle_ptr, const **A** gain_factor) Sets the channel g
void	**ADC_MEASUREM** **ADC_MEASUREM** handle_ptr, XMC_V boundary, XMC_VA boundary_selectio

	Select the boundai
void	**ADC_MEASUREM** (const **ADC_MEAS** *const handle_ptr, Sets the upper bou
void	**ADC_MEASUREM** (const **ADC_MEAS** *const handle_ptr, Sets the lower bou
XMC_VADC_CHANNEL_ALIAS_t	**ADC_MEASUREM** **ADC_MEASUREM** handle_ptr) Returns the configu
void	**ADC_MEASUREM** **ADC_MEASUREM** Enables uniform co slaves.

Methods

Function Documentation

void ADC_MEASUREMENT_ADV_ConfigureChannelClass (const A
const X
)

Configures the input class (Resolution and Sampling time).

Parameters:

iclass_selection	Select the input class to be configured Pass XMC_VADC_CHANNEL_CONV_GROUP_CLA to configure group input class 0. Pass XMC_VADC_CHANNEL_CONV_GROUP_CLA to configure group input class 1.
config	Constant pointer to the input class configuratior
group_num	The group number whose input class needs to l configured.

Returns:
None

Description:
Configures the input class for standard conversion (GxICLASS[0] OR GxICLASS[1]). A call to this API would configure the Resolution and sampling time for standard conversion. The group-specific input class registers define the sample time and data conversion mode for each channel of the respective group. And each channel can use these by selecting the input class in GxCHCTRy.ICLSEL.

Example Usage:

```
// Initialize the ADC_MEASUREMENT_ADV APP. Set th
e number of required channels to 2.
```

```
// Select the request source APP from ADC_SCAN to
 ADC_QUEUE.
// Goto the sequence plan and select Channel_A at
 position-0 and Channel_B at position-1.
// Enable Wait for trigger for the Channel_A.
// Goto interrupts tab enable request source inte
rrupt.
// Goto the ADC_QUEUE APP and enable the request
source interrupt.
// Generate the code and build.
// Replace this in the main.c.
#include <DAVE.h>                 //Declarations
from DAVE Code Generation (includes SFR declarati
on)

uint16_t result[2];
void adc_measurement_adv_callback(void)
{
  // converted result will be of 8bit resolution.
  result[0] = ADC_MEASUREMENT_ADV_GetResult(&ADC_
MEASUREMENT_ADV_0_Channel_A);
  result[1] = ADC_MEASUREMENT_ADV_GetResult(&ADC_
MEASUREMENT_ADV_0_Channel_B);
}

int main(void)
{
  DAVE_STATUS_t status;

  XMC_VADC_GROUP_CLASS_t res_8bit = {
      .conversion_mode_standard = XMC_VADC_CONVMO
DE_8BIT,
      .sample_time_std_conv     = 10U
  };

  status = DAVE_Init();           // Initializati
on of DAVE APPs
```

```
  if(status == DAVE_STATUS_FAILURE)
  {
    // Placeholder for error handler code. The while loop below can be replaced with an user error handler.
    XMC_DEBUG("DAVE APPs initialization failed\n");

    while(1U)
    {

    }
  }

  ADC_MEASUREMENT_ADV_ConfigureChannelClass(&ADC_MEASUREMENT_ADV_0_Channel_A,&res_8bit);

  // Start the selected request source
  ADC_MEASUREMENT_ADV_StartADC(&ADC_MEASUREMENT_ADV_0);

  // Start the queue conversion sequence
  ADC_MEASUREMENT_ADV_SoftwareTrigger(&ADC_MEASUREMENT_ADV_0);

  while(1U)
  {
  }
}
```

Definition at line **968** of file **ADC_MEASUREMENT_ADV.c**.

References **ADC_MEASUREMENT_ADV_CHANNEL::ch_handle**, and **ADC_MEASUREMENT_ADV_CHANNEL::group_index**.

XMC_VADC_CHANNEL_ALIAS_t ADC_MEASUREMENT_ADV_GetA

Returns the configured alias value.

Parameters:

handle_ptr constant pointer to the channel handle structure. (Use the channel handle related macros which are defined in adc_measure_adv_conf.h)

Returns:

XMC_VADC_CHANNEL_ALIAS_t returns XMC_VADC_CHANNEL_ALIAS_DISABLED if the alias is not applicable to the channel or if alias is not enabled
else it returns the alias value.

Description:

Return the alias value for the channel. If the alias feature is enabled then the channels CH-0 or CH-1 can convert any other channel's input signal. The API returns XMC_VADC_CHANNEL_ALIAS_DISABLED if the Channel is neither CH-0 nor CH-1. Also the value XMC_VADC_CHANNEL_ALIAS_DISABLED is returned when the CH-0 or CH-1 is not configured with alias. If either CH-0 or CH-1 is configured with alias then the appropriate aliased channel number is returned. A call to this API would access the register GxALIAS.

Example Usage:

```
// Initialize the ADC_MEASUREMENT_ADV APP. Set th
e number of required channels to 2.
// Select the request source APP as ADC_SCAN.
// Generate the code and build.
// Replace this in the main.c.
#include <DAVE.h>                 //Declarations
from DAVE Code Generation (includes SFR declarati
on)
```

```
#define MAX_LOCAL_BUFFER (16U)
uint16_t result[16];
uint16_t i = 0U;

void channel_event_callback(void)
{
  result[i++] = ADC_MEASUREMENT_ADV_GetResult(&AD
C_MEASUREMENT_ADV_0_Channel_A);
  if(MAX_LOCAL_BUFFER == i)
  {
    i = 0U;
  }
}

int main(void)
{
  DAVE_STATUS_t status;
  XMC_VADC_CHANNEL_ALIAS_t alias_ch;

  status = DAVE_Init();           // Initializati
on of DAVE APPs

  if(status == DAVE_STATUS_FAILURE)
  {
    // Placeholder for error handler code. The wh
ile loop below can be replaced with an user error
 handler.
    XMC_DEBUG("DAVE APPs initialization failed\n"
);

    while(1U)
    {

    }
  }
```

```
  // Check if the given channel is aliased.
  alias_ch = ADC_MEASUREMENT_ADV_GetAliasValue(&ADC_MEASUREMENT_ADV_0_Channel_A);

  if(XMC_VADC_CHANNEL_ALIAS_DISABLED == alias_ch)
  {
     // do something
  }

  // Start the selected request source
  ADC_MEASUREMENT_ADV_StartADC(&ADC_MEASUREMENT_ADV_0);

  while(1U)
  {
    // Continuously re-trigger the scan conversion sequence
    ADC_MEASUREMENT_ADV_SoftwareTrigger(&ADC_MEASUREMENT_ADV_0);
  }
}
```

Definition at line **1054** of file **ADC_MEASUREMENT_ADV.c**.

References **ADC_MEASUREMENT_ADV_CHANNEL::ch_num**, and **ADC_MEASUREMENT_ADV_CHANNEL::group_index**.

DAVE_APP_VERSION_t ADC_MEASUREMENT_ADV_GetAppVersi

Get **ADC_MEASUREMENT_ADV** APP version.

Returns:

DAVE_APP_VERSION_t APP version information (major, minor and patch number)

Description:

The function can be used to check application software compatibility with a specific version of the APP.

Example Usage:

```
#include <DAVE.h>

int main(void) {
  DAVE_STATUS_t init_status;
  DAVE_APP_VERSION_t version;

  // Initialize ADC_MEASUREMENT_ADV APP:
  // ADC_MEASUREMENT_ADV_Init() is called from w
ithin DAVE_Init().
  init_status = DAVE_Init();

  version = ADC_MEASUREMENT_ADV_GetAppVersion();
  if (version.major != 1U) {
    // Probably, not the right version.
  }

  // More code here
  while(1) {

  }
  return (0);
}
```

Definition at line **682** of file **ADC_MEASUREMENT_ADV.c**.

__STATIC_INLINE XMC_VADC_DETAILED_RESULT_t ADC_MEASU

Returns the complete conversion result.

Parameters:

handle_ptr constant pointer to the channel handle structure.

(Use the channel handle related macros which are defined in adc_measure_adv_conf.h)

Returns:

XMC_VADC_DETAILED_RESULT_t returns the complete result register

Description:

Return the completely 32 bit result register (GxRESy). In the APP each channel is configured to a particular group result register (excluding FIFO). The result of conversion as well as other information is returned from this API. The detailed result contains result of the most recent conversion, the channel number requested the conversion, valid flag, converted request source, fast compare result, the result data reduction counter and the EMUX channel number (if GxRES[0] only). In polling mechanism the converted result can be read out after checking the valid flag bit. The result register is defined in the channel handle structure **ADC_MEASUREMENT_ADV_CHANNEL_t**. Hence this API shall call be called with a pointer to the channel handle of type **ADC_MEASUREMENT_ADV_CHANNEL_t** (Directly use the channel handle related macros which are defined in adc_measure_adv_conf.h).

Note:

This API is not Applicable for reading the result from the result FIFO registers Use **ADC_MEASUREMENT_ADV_GetFifoDetailedResult** in order to read the FIFO result.

Example Usage:

```
// Initialize the ADC_MEASUREMENT_ADV APP. Set th
e number of required channels to 2.
// Select the request source APP from ADC_SCAN to
 ADC_QUEUE.
// Goto the sequence plan and select Channel_A at
 position-0 and Channel_B at position-1.
```

```
// Enable Wait for trigger for the Channel_A.
// Goto interrupts tab enable request source interrupt.
// Goto the ADC_QUEUE APP and enable the request source interrupt.
// Generate the code and build.
// Replace this in the main.c.
#include <DAVE.h>                 //Declarations from DAVE Code Generation (includes SFR declaration)
#define QUEUE_SRC (0U)

XMC_VADC_DETAILED_RESULT_t result[2];
uint32_t queue_flag = 0U;

void adc_measurement_adv_callback(void)
{
  // Use the channel handle parameter in this format "<APP Name>_<CHANNEL Name>"
  result[0] = ADC_MEASUREMENT_ADV_GetDetailedResult(&ADC_MEASUREMENT_ADV_0_Channel_A);
  result[1] = ADC_MEASUREMENT_ADV_GetDetailedResult(&ADC_MEASUREMENT_ADV_0_Channel_B);

  if((result[0].converted_request_source == QUEUE_SRC) && (QUEUE_SRC == result[1].converted_request_source))
  {
    queue_flag++;
  }

}

int main(void)
{
  DAVE_STATUS_t status;
```

```
  status = DAVE_Init();           // Initializati
on of DAVE APPs

  if(status == DAVE_STATUS_FAILURE)
  {
    // Placeholder for error handler code. The wh
ile loop below can be replaced with an user error
 handler.
    XMC_DEBUG("DAVE APPs initialization failed\n"
);

    while(1U)
    {

    }
  }

  ADC_MEASUREMENT_ADV_StartADC(&ADC_MEASUREMENT_A
DV_0);

    // Start the queue conversion sequence
  ADC_MEASUREMENT_ADV_SoftwareTrigger(&ADC_MEASUR
EMENT_ADV_0);

  while(queue_flag != 0U);
  // do something

  while(1U)
  {
  }
}
```

Definition at line **731** of file **ADC_MEASUREMENT_ADV.h**.

References **ADC_MEASUREMENT_ADV_CHANNEL::ch_handle**, and **ADC_MEASUREMENT_ADV_CHANNEL::group_index**.

__STATIC_INLINE ADC_MEASUREMENT_ADV_FAST_COMPARE_t

Returns the result of fast conversion.

Parameters:

handle_ptr	constant pointer to the channel handle structure. (Use the channel handle related macros which are defined in adc_measure_adv_conf.h)

Returns:

XMC_VADC_FAST_COMPARE_t fast conversion result. Returns ::ADC_MEASUREMENT_ADV_FAST_COMPARE_HIGH if the sampled signal is greater than the compare value. Returns ::ADC_MEASUREMENT_ADV_FAST_COMPARE_LOW if the sampled signal is lower than the compare value. Returns ::ADC_MEASUREMENT_ADV_FAST_COMPARE_INVALID if there is no valid result available.

Description:

Returns the fast conversion result stored in the result register [GxRESy.FCR]. In the APP each channel is configured to a particular group result register (excluding FIFO). The result register is defined in the channel handle structure **ADC_MEASUREMENT_ADV_CHANNEL_t**. Hence this API shall call be called with a pointer to the channel handle of type **ADC_MEASUREMENT_ADV_CHANNEL_t** (Directly use the channel handle related macros which are defined in adc_measure_adv_conf.h).

Note:

This API is only applicable to read fast compare result of the particular channel.

Example Usage:

```
// Initialize the ADC_MEASUREMENT_ADV APP. Set th
```

```
e number of required channels to 1.
// Select the request source APP from ADC_SCAN to
 ADC_QUEUE.
// Goto the sequence plan and select Channel_A at
 position-0 and enable the refill.
// Enable Wait for trigger for the Channel_A.
// Goto interrupts tab enable result event for Ch
annel_A.
// Instantiate the interrupt APP.
// In the UI of the interrupt APP change the inte
rrupt handler to "channel_event_callback"
// goto HW signal connectivity and connect event_
result_Channel_A to interrupt APP.
// Generate the code and build.
// Replace this in main.c.
#include <DAVE.h>                 //Declarations
from DAVE Code Generation (includes SFR declarati
on)

#define MAX_LOCAL_BUFFER (16U)
ADC_MEASUREMENT_ADV_FAST_COMPARE_t result[16];
uint16_t i = 0U;

void channel_event_callback(void)
{
  result[i++] = ADC_MEASUREMENT_ADV_GetFastCompar
eResult(&ADC_MEASUREMENT_ADV_0_Channel_A);
  if(MAX_LOCAL_BUFFER == i)
  {
    i = 0U;
  }
}

int main(void)
{
  DAVE_STATUS_t status;
```

```
  status = DAVE_Init();           // Initializati
on of DAVE APPs

  if(status == DAVE_STATUS_FAILURE)
  {
    // Placeholder for error handler code. The wh
ile loop below can be replaced with an user error
 handler.
    XMC_DEBUG("DAVE APPs initialization failed\n"
);

    while(1U)
    {

    }
  }

  // Set the threshold value as Vdd/2
  ADC_MEASUREMENT_ADV_SetFastCompareValue(&ADC_ME
ASUREMENT_ADV_0_Channel_A,512U);

  // Start the selected request source
  ADC_MEASUREMENT_ADV_StartADC(&ADC_MEASUREMENT_A
DV_0);

  while(1U)
  {
  // Continuously trigger the queue conversion se
quence
  ADC_MEASUREMENT_ADV_SoftwareTrigger(&ADC_MEASUR
EMENT_ADV_0);
  }
}
```

Definition at line **1001** of file **ADC_MEASUREMENT_ADV.h**.

References **ADC_MEASUREMENT_ADV_CHANNEL::ch_handle**, and **ADC_MEASUREMENT_ADV_CHANNEL::group_index**.

__STATIC_INLINE XMC_VADC_DETAILED_RESULT_t ADC_MEASU

Returns the complete conversion result.

Parameters:

handle_ptr	constant pointer to the channel handle structure. (Use the channel handle related macros which are defined in adc_measure_adv_conf.h)

Returns:

XMC_VADC_DETAILED_RESULT_t returns the complete result register

Description:

Return the completely 32 bit FIFO result register (GxRESy). If result FIFO is configured then the results are available in the FIFO tail register. The result of conversion as well as other information is returned from this API. The detailed result contains result of the most recent conversion, the channel number requested the conversion, valid flag, converted request source, fast compare result, the result data reduction counter and the EMUX channel number (if GxRES[0] only). In polling mechanism the converted result can be read out after checking the valid flag bit. The result register is defined in the channel handle structure **ADC_MEASUREMENT_ADV_CHANNEL_t**. Hence this API shall call be called with a pointer to the channel handle of type **ADC_MEASUREMENT_ADV_CHANNEL_t** (Directly use the channel handle related macros which are defined in adc_measure_adv_conf.h).

Note:

This API is not Applicable for reading the result from channels which done use FIFO. Use **ADC_MEASUREMENT_ADV_GetDetailedResult** in order to read from a single result register.

Example Usage:

```
// Initialize the ADC_MEASUREMENT_ADV APP. Set the number of required channels to 2.
// Select the request source APP from ADC_SCAN to ADC_QUEUE.
// Goto the sequence plan and select Channel_A at position-0 and Channel_B at position-1.
// Enable Wait for trigger for the Channel_A.
// Goto interrupts tab enable request source interrupt.
// Goto the ADC_QUEUE APP and enable the request source interrupt.
// Generate the code and build.
// Replace this in the main.c.
#include <DAVE.h>                 //Declarations from DAVE Code Generation (includes SFR declaration)

#define MAX_FIFO (16U)
XMC_VADC_DETAILED_RESULT_t result[16];
uint16_t i = 0U;
void adc_measurement_adv_callback(void)
{
  // Use the channel handle parameter in this format "<APP Name>_<CHANNEL Name>"
  result[i++] = ADC_MEASUREMENT_ADV_GetFifoDetailedResult(&ADC_MEASUREMENT_ADV_0_Channel_A);
  result[i++] = ADC_MEASUREMENT_ADV_GetFifoDetailedResult(&ADC_MEASUREMENT_ADV_0_Channel_B);

  if(MAX_FIFO == i)
  {
    i = (uint32_t)0;
  }
```

```
}

int main(void)
{
  DAVE_STATUS_t status;

  status = DAVE_Init();           // Initializati
on of DAVE APPs

  if(status == DAVE_STATUS_FAILURE)
  {
    // Placeholder for error handler code. The wh
ile loop below can be replaced with an user error
 handler.
    XMC_DEBUG("DAVE APPs initialization failed\n"
);

    while(1U)
    {

    }
  }

  // Start the selected request source
  ADC_MEASUREMENT_ADV_StartADC(&ADC_MEASUREMENT_A
DV_0);

  // Start the queue conversion sequence
  ADC_MEASUREMENT_ADV_SoftwareTrigger(&ADC_MEASUR
EMENT_ADV_0);

  while(1U)
  {
  }
}
```

Definition at line **908** of file **ADC_MEASUREMENT_ADV.h**.

References
ADC_MEASUREMENT_ADV_CHANNEL::group_index, and
ADC_MEASUREMENT_ADV_CHANNEL::result_fifo_tail_number.

__STATIC_INLINE uint16_t ADC_MEASUREMENT_ADV_GetFifoRes

Returns the conversion result.

Parameters:

handle_ptr	constant pointer to the channel handle structure. (Use the channel handle related macros which are defined in adc_measure_adv_conf.h)

Returns:

uint16_t conversion result.
Range: [0x0 to 0xFFF] without any filters/ accumulation/ subtraction enabled.

Description:

Returns the converted result stored in the result FIFO register [GxRESy.RESULT]. If result FIFO is configured then the results are available in the FIFO tail register. The result register can only be read at the tail of the FIFO, This result register number is defined in the channel handle structure **ADC_MEASUREMENT_ADV_CHANNEL_t**. Hence this API shall call be called with a pointer to the channel handle of type **ADC_MEASUREMENT_ADV_CHANNEL_t** (Directly use the channel handle related macros which are defined in adc_measure_adv_conf.h).

Note:

This API is not Applicable for reading the result from channels which done use FIFO. Use **ADC_MEASUREMENT_ADV_GetResult** in order to read from a single result register.

Example Usage:

```
// Initialize the ADC_MEASUREMENT_ADV APP. Set th
e number of required channels to 2.
// Select the request source APP from ADC_SCAN to
 ADC_QUEUE.
// Goto the sequence plan and select Channel_A at
 position-0 and Channel_B at position-1.
// Enable Wait for trigger for the Channel_A.
// Goto postprocessing Tab and select 8 stages FI
FO for both Channel_A and Channel_B
// Goto interrupts tab enable request source inte
rrupt.
// Goto the ADC_QUEUE APP and enable the request
source interrupt.
// Generate the code and build.
// Replace this in the main.c.
#include <DAVE.h>                 //Declarations
from DAVE Code Generation (includes SFR declarati
on)

#define MAX_FIFO (16U)
uint16_t result[16];
uint16_t i;
void adc_measurement_adv_callback(void)
{
  // Use the channel handle parameter in this for
mat "<APP Name>_<CHANNEL Name>"
  result[i++] = ADC_MEASUREMENT_ADV_GetFifoResult
(&ADC_MEASUREMENT_ADV_0_Channel_A);
  result[i++] = ADC_MEASUREMENT_ADV_GetFifoResult
(&ADC_MEASUREMENT_ADV_0_Channel_B);

  if(MAX_FIFO == i)
  {
    i = (uint32_t)0;
  }
}
```

```
int main(void)
{
  DAVE_STATUS_t status;

  status = DAVE_Init();           // Initializati
on of DAVE APPs

  if(status == DAVE_STATUS_FAILURE)
  {
    // Placeholder for error handler code. The wh
ile loop below can be replaced with an user error
 handler.
    XMC_DEBUG("DAVE APPs initialization failed\n"
);

    while(1U)
    {

    }
  }

  // Start the selected request source
  ADC_MEASUREMENT_ADV_StartADC(&ADC_MEASUREMENT_A
DV_0);

    // Start the queue conversion sequence
  ADC_MEASUREMENT_ADV_SoftwareTrigger(&ADC_MEASUR
EMENT_ADV_0);

  while(1U)
  {
  }
}
```

Definition at line **821** of file **ADC_MEASUREMENT_ADV.h**.

References
ADC_MEASUREMENT_ADV_CHANNEL::group_index, and
ADC_MEASUREMENT_ADV_CHANNEL::result_fifo_tail_number.

__STATIC_INLINE uint16_t ADC_MEASUREMENT_ADV_GetResult (

Returns the conversion result.

Parameters:

handle_ptr	constant pointer to the channel handle structure. (Use the channel handle related macros which are defined in adc_measure_adv_conf.h)

Returns:

uint16_t conversion result.
Range: [0x0 to 0xFFF] without any filters/ accumulation/ subtraction enabled.

Description:

Return the converted result stored in the result register [GxRESy.RESULT]. In the APP each channel is configured to a particular group result register (excluding FIFO). The result register is defined in the channel handle structure **ADC_MEASUREMENT_ADV_CHANNEL_t**. Hence this API shall call be called with a pointer to the channel handle of type **ADC_MEASUREMENT_ADV_CHANNEL_t** (Directly use the channel handle related macros which are defined in adc_measure_adv_conf.h).

Note:

This API is not Applicable for reading the result from the result FIFO registers Use **ADC_MEASUREMENT_ADV_GetFifoResult** in order to read the FIFO result.

Example Usage:

```
// Initialize the ADC_MEASUREMENT_ADV APP. Set the number of required channels to 2.
// Select the request source APP from ADC_SCAN to ADC_QUEUE.
// Goto the sequence plan and select Channel_A at position-0 and Channel_B at position-1.
// Enable Wait for trigger for the Channel_A.
// Goto interrupts tab enable request source interrupt.
// Goto the ADC_QUEUE APP and enable the request source interrupt.
// Generate the code and build.
// Replace this in the main.c.
#include <DAVE.h>                 //Declarations from DAVE Code Generation (includes SFR declaration)

uint16_t result[2];
void adc_measurement_adv_callback(void)
{
  // Use the channel handle parameter in this format "<APP Name>_<CHANNEL Name>"
  result[0] = ADC_MEASUREMENT_ADV_GetResult(&ADC_MEASUREMENT_ADV_0_Channel_A);
  result[1] = ADC_MEASUREMENT_ADV_GetResult(&ADC_MEASUREMENT_ADV_0_Channel_B);
}

int main(void)
{
  DAVE_STATUS_t status;

  status = DAVE_Init();           // Initialization of DAVE APPs

  if(status == DAVE_STATUS_FAILURE)
  {
```

```
    // Placeholder for error handler code. The while loop below can be replaced with an user error handler.
    XMC_DEBUG("DAVE APPs initialization failed\n");

    while(1U)
    {

    }
  }

  // Start the selected request source
  ADC_MEASUREMENT_ADV_StartADC(&ADC_MEASUREMENT_ADV_0);

  // Start the queue conversion sequence
  ADC_MEASUREMENT_ADV_SoftwareTrigger(&ADC_MEASUREMENT_ADV_0);

  while(1U)
  {
  }
}
```

Definition at line **638** of file **ADC_MEASUREMENT_ADV.h**.

References **ADC_MEASUREMENT_ADV_CHANNEL::ch_handle**, and **ADC_MEASUREMENT_ADV_CHANNEL::group_index**.

ADC_MEASUREMENT_ADV_STATUS_t ADC_MEASUREMENT_ADV

Initializes the **ADC_MEASUREMENT_ADV** APP Instance.

Parameters:

handle_ptr constant pointer to the APP handle structure

Returns:

None

Description:

Initialize the ADC and all the required configurations. A call to this API would initialize the queue request source or the scan request source depending on the GUI selection. The initialization is taken up by calling ADC_QUEUE_Init() or ADC_SCAN_Init(). Following this the synchronous conversion related initializations are taken up. In the sync initialization the slave groups and the master group are powered down and either GxSYNCTR.STSEL (if Slave) or GxSYNCTR.EVALRy (if master) are configured. After the sync related configurations are completed the master group alone is powered on. Following this the result event or channel event related service request node configurations are done (if required). Then the GxCHCTR configurations are completed. After the channel initialization the result handling initializations are done. This entails configuring the GxRCR registers for result filtering, accumulation, subtraction and FIFO. After all these initialization are completed the channels configured in the GUI is inserted into the appropriate ADC_QUEUE or ADC_SCAN APP buffer. If the GUI check box "Insert channels at initialization" is enable then these entries is pushed to the Hardware.

Example Usage:

```
 #include <DAVE.h>
 int main(void)
 {
    DAVE_Init(); //ADC_MEASUREMENT_ADV_Init is ca
lled within DAVE_Init
    return 0;
 }
```

Definition at line **796** of file **ADC_MEASUREMENT_ADV.c**.

References **ADC_MEASUREMENT_ADV_StartADC()**, **ADC_MEASUREMENT_ADV_STATUS_UNINITIALIZED**, **ADC_MEASUREMENT_ADV_CHANNEL::analog_io_config**, **ADC_MEASUREMENT_ADV_CHANNEL::ch_handle**, **ADC_MEASUREMENT_ADV_CHANNEL::ch_num**, **ADC_MEASUREMENT_ADV::channel_array**, **ADC_MEASUREMENT_ADV::event_config**, **ADC_MEASUREMENT_ADV_CHANNEL::group_index**, **ADC_MEASUREMENT_ADV::init_state**, **ADC_MEASUREMENT_ADV::req_src**, **ADC_MEASUREMENT_ADV_CHANNEL::shs_gain_factor**, **ADC_MEASUREMENT_ADV::start_at_initialization**, **ADC_MEASUREMENT_ADV::total_number_of_channels**, and **ADC_MEASUREMENT_ADV::total_number_of_entries**.

void ADC_MEASUREMENT_ADV_SelectBoundary (const ADC_ME
XMC_VADC_BO
XMC_VADC_CH
)

Select the boundary for the channel.

Parameters:

handle_ptr	constant pointer to the channel handle structure. (Use the channel handle related macros which are defined in adc_measure_adv_conf.h)
boundary	The lower boundary or upper boundary of the channel to be configured.
boundary_selection	Boundary register selection for the particular channel.

Returns:

None

Description:

Select the boundary for the channel. This API will select either lower boundary or the upper boundary depending on **boundary** and configures the **boundary_selection** value into the GxCHCTRy.BNDSELL or GxCHCTRy.BNDSELU accordingly.

Example Usage:

```
// Initialize the ADC_MEASUREMENT_ADV APP. Set th
e number of required channels to 1.
// Select the request source APP from ADC_SCAN to
 ADC_QUEUE.
// Goto the sequence plan and select Channel_A at
 position-0 and enable the refill.
// Enable Wait for trigger for the Channel_A.
// Goto the Boundary Settings tab and select the
channel name as Channel_A.
// Change the channel event from No to "If Result
 Inside Band".
// Change the "Generate boundary flag" to Yes/Non
-Inverted.
// Instantiate the interrupt APP.
// In the UI of the interrupt APP change the inte
rrupt handler to "channel_event_callback"
// goto HW signal connectivity and connect event_
channel_Channel_A to interrupt APP.
// Generate the code and build.
// Replace this in the main.c.
#include <DAVE.h>                 //Declarations
from DAVE Code Generation (includes SFR declarati
on)

#define MAX_LOCAL_BUFFER (16U)
uint16_t result[16];
uint16_t i = 0U;

void channel_event_callback(void)
```

```
{
  result[i++] = ADC_MEASUREMENT_ADV_GetResult(&ADC_MEASUREMENT_ADV_0_Channel_A);
  if(MAX_LOCAL_BUFFER == i)
  {
    i = 0U;
  }
}

int main(void)
{
  DAVE_STATUS_t status;

  status = DAVE_Init();           // Initialization of DAVE APPs

  if(status == DAVE_STATUS_FAILURE)
  {
    // Placeholder for error handler code. The while loop below can be replaced with an user error handler.
    XMC_DEBUG("DAVE APPs initialization failed\n");

    while(1U)
    {

    }
  }

  // Set the boundary selection for Channel_A lower Bound as Group Bound-1
  ADC_MEASUREMENT_ADV_SelectBoundary(&ADC_MEASUREMENT_ADV_0_Channel_A, XMC_VADC_BOUNDARY_SELECT_LOWER_BOUND,
                                     XMC_VADC_CHANNEL_BOUNDARY_GROUP_BOUND1);
```

```
  // Set the boundary selection for Channel_A upper Bound as Group Bound-0 and also the value as 2048U
  ADC_MEASUREMENT_ADV_SetBoundaryUpper(&ADC_MEASUREMENT_ADV_0_Channel_A, 2048U);

  // Start the selected request source
  ADC_MEASUREMENT_ADV_StartADC(&ADC_MEASUREMENT_ADV_0);

  while(1U)
  {
  // Continuously trigger the queue conversion sequence
  ADC_MEASUREMENT_ADV_SoftwareTrigger(&ADC_MEASUREMENT_ADV_0);
  }
}
```

Definition at line **1014** of file **ADC_MEASUREMENT_ADV.c**.

References **ADC_MEASUREMENT_ADV_CHANNEL::ch_num**, and **ADC_MEASUREMENT_ADV_CHANNEL::group_index**.

void ADC_MEASUREMENT_ADV_SetAlternateReference (const AI
const XM
)

Selects alternate reference voltage for the channel.

Parameters:

handle_ptr	constant pointer to the channel handle structure. (Use the channel handle related macros which are defined in adc_measure_adv_conf.h)

reference_select Voltage reference for the channel.

Returns:

None

Description:

Select the reference voltage for conversion. For XMC4000 series, an internal voltage reference (VARef) or an external voltage reference fed to Ch-0 can serve as a voltage reference for conversions. For XMC1000 series, an internal ground reference (Vss) or an external reference ground from CH-0 can serve as an alternate reference. A call to this API would configure the register bit field GxCHCTR.REFSEL.

Example Usage:

```
// Initialize the ADC_MEASUREMENT_ADV APP. Set th
e number of required channels to 2.
// Goto interrupts tab enable request source inte
rrupt.
// Goto the ADC_SCAN APP and enable the request s
ource interrupt.
// Generate the code and build.
// Replace this in the main.c.
#include <DAVE.h>                 //Declarations
from DAVE Code Generation (includes SFR declarati
on)

uint16_t result[2];
void adc_measurement_adv_callback(void)
{
  result[0] = ADC_MEASUREMENT_ADV_GetResult(&ADC_
MEASUREMENT_ADV_0_Channel_A);
  result[1] = ADC_MEASUREMENT_ADV_GetResult(&ADC_
MEASUREMENT_ADV_0_Channel_B);
}
```

```
int main(void)
{
  DAVE_STATUS_t status;

  status = DAVE_Init();           // Initializati
on of DAVE APPs

  if(status == DAVE_STATUS_FAILURE)
  {
    // Placeholder for error handler code. The wh
ile loop below can be replaced with an user error
 handler.
    XMC_DEBUG("DAVE APPs initialization failed\n"
);

    while(1U)
    {

    }
  }

  // Start the selected request source
  ADC_MEASUREMENT_ADV_StartADC(&ADC_MEASUREMENT_A
DV_0);

  // connect the alternate reference to the chann
el-0 pin of Channel_A's group.
  ADC_MEASUREMENT_ADV_SetAlternateReference(&ADC_
MEASUREMENT_ADV_0_Channel_A, XMC_VADC_CHANNEL_REF
_ALT_CH0);

  while(1U)
  {
    // Continuously re-trigger the scan conversio
n sequence
    ADC_MEASUREMENT_ADV_SoftwareTrigger(&ADC_MEAS
UREMENT_ADV_0);
```

```
    }
}
```

Definition at line **979** of file **ADC_MEASUREMENT_ADV.c**.

References **ADC_MEASUREMENT_ADV_CHANNEL::ch_num**, and **ADC_MEASUREMENT_ADV_CHANNEL::group_index**.

void ADC_MEASUREMENT_ADV_SetBoundaryLower (const ADC_
uint32_t
)

Sets the lower boundary value for the channel.

Parameters:

handle_ptr	constant pointer to the channel handle structure. (Use the channel handle related macros which are defined in adc_measure_adv_conf.h)
boundary_value	The boundary value that needs to be configured in the lower boundary register.

Returns:

None

Description:

Sets the lower boundary value for the channel. This API will set the lower boundary value depending on boundary selected for the channel in the GUI of the APP. Thus also configured in the API is either the register GLOBBOUND or GxBOUND.

Note:

This API will configure the lower boundary for the channel according to the selection done in the GUI. Runtime change of the lower boundary selection will not be handled by this API.

Example Usage:

```
// Initialize the ADC_MEASUREMENT_ADV APP. Set th
e number of required channels to 1.
// Select the request source APP as ADC_SCAN.
// Goto the Boundary Settings tab and select the
channel name as Channel_A.
// Select the Upper boundary as Group boundary 1.
// Change the channel event from No to "If Result
 Inside Band".
// Change the "Generate boundary flag" to Yes/Non
-Inverted.
// Instantiate the interrupt APP.
// In the UI of the interrupt APP change the inte
rrupt handler to "channel_event_callback"
// goto HW signal connectivity and connect event_
channel_Channel_A to interrupt APP.
// Generate the code and build.
// Replace this in the main.c.
#include <DAVE.h>                 //Declarations
from DAVE Code Generation (includes SFR declarati
on)

#define MAX_LOCAL_BUFFER (16U)
uint16_t result[16];
uint16_t i = 0U;

void channel_event_callback(void)
{
  result[i++] = ADC_MEASUREMENT_ADV_GetResult(&AD
C_MEASUREMENT_ADV_0_Channel_A);
  if(MAX_LOCAL_BUFFER == i)
  {
    i = 0U;
  }
}
```

```
int main(void)
{
  DAVE_STATUS_t status;

  status = DAVE_Init();           // Initializati
on of DAVE APPs

  if(status == DAVE_STATUS_FAILURE)
  {
    // Placeholder for error handler code. The wh
ile loop below can be replaced with an user error
 handler.
    XMC_DEBUG("DAVE APPs initialization failed\n"
);

    while(1U)
    {

    }
  }

  // Set the boundary selection for Channel_A low
er Bound as Group Bound-1
  ADC_MEASUREMENT_ADV_SetBoundaryLower(&ADC_MEASU
REMENT_ADV_0_Channel_A,1024);

  // Set the boundary selection for Channel_A upp
er Bound as Group Bound-0 and also the value as 2
048U
  ADC_MEASUREMENT_ADV_SetBoundaryUpper(&ADC_MEASU
REMENT_ADV_0_Channel_A,2048);

  // Start the selected request source
  ADC_MEASUREMENT_ADV_StartADC(&ADC_MEASUREMENT_A
DV_0);

  while(1U)
```

```
  {
    // Continuously re-trigger the scan conversio
n sequence
    ADC_MEASUREMENT_ADV_SoftwareTrigger(&ADC_MEAS
UREMENT_ADV_0);
  }
}
```

Definition at line **1040** of file **ADC_MEASUREMENT_ADV.c**.

References **ADC_MEASUREMENT_ADV_CHANNEL::ch_handle**.

void ADC_MEASUREMENT_ADV_SetBoundaryUpper (const ADC_
uint32_t
)

Sets the upper boundary value for the channel.

Parameters:

handle_ptr	constant pointer to the channel handle structure. (Use the channel handle related macros which are defined in adc_measure_adv_conf.h)
boundary_value	The boundary value that needs to be configured in the upper boundary register.

Returns:

None

Description:

Sets the upper boundary value for the channel. This API will set the upper boundary value depending on boundary selected for the channel in the GUI of the APP. Thus also configured in the API is either the register GLOBBOUND or GxBOUND.

Note:

This API will configure the upper boundary for the channel according to the selection done in the GUI. Runtime change of the Upper boundary selection will not be handled by this API.

Example Usage:

```
// Initialize the ADC_MEASUREMENT_ADV APP. Set th
e number of required channels to 1.
// Select the request source APP as ADC_SCAN.
// Goto the Boundary Settings tab and select the
channel name as Channel_A.
// Select the Upper boundary as Group boundary 1.
// Change the channel event from No to "If Result
 Inside Band".
// Change the "Generate boundary flag" to Yes/Non
-Inverted.
// Instantiate the interrupt APP.
// In the UI of the interrupt APP change the inte
rrupt handler to "channel_event_callback"
// goto HW signal connectivity and connect event_
channel_Channel_A to interrupt APP.
// Generate the code and build.
// Replace this in the main.c.
#include <DAVE.h>                 //Declarations
from DAVE Code Generation (includes SFR declarati
on)

#define MAX_LOCAL_BUFFER (16U)
uint16_t result[16];
uint16_t i = 0U;

void channel_event_callback(void)
{
  result[i++] = ADC_MEASUREMENT_ADV_GetResult(&AD
C_MEASUREMENT_ADV_0_Channel_A);
  if(MAX_LOCAL_BUFFER == i)
  {
```

```
    i = 0U;
  }
}

int main(void)
{
  DAVE_STATUS_t status;

  status = DAVE_Init();           // Initializati
on of DAVE APPs

  if(status == DAVE_STATUS_FAILURE)
  {
    // Placeholder for error handler code. The wh
ile loop below can be replaced with an user error
 handler.
    XMC_DEBUG("DAVE APPs initialization failed\n"
);

    while(1U)
    {

    }
  }

  // Set the boundary selection for Channel_A low
er Bound as Group Bound-1
  ADC_MEASUREMENT_ADV_SetBoundaryLower(&ADC_MEASU
REMENT_ADV_0_Channel_A,1024);

  // Set the boundary selection for Channel_A upp
er Bound as Group Bound-0 and also the value as 2
048U
  ADC_MEASUREMENT_ADV_SetBoundaryUpper(&ADC_MEASU
REMENT_ADV_0_Channel_A,2048);

  // Start the selected request source
```

```
  ADC_MEASUREMENT_ADV_StartADC(&ADC_MEASUREMENT_A
DV_0);

  while(1U)
  {
    // Continuously re-trigger the scan conversio
n sequence
    ADC_MEASUREMENT_ADV_SoftwareTrigger(&ADC_MEAS
UREMENT_ADV_0);
  }
}
```

Definition at line **1027** of file **ADC_MEASUREMENT_ADV.c**.

References **ADC_MEASUREMENT_ADV_CHANNEL::ch_handle**.

void ADC_MEASUREMENT_ADV_SetChannelGain (const ADC_ME
const ADC_ME
)

Sets the channel gain.

Parameters:

handle_ptr constant pointer to the channel handle structure. (Use the channel handle related macros which are defined in adc_measure_adv_conf.h)

gain_factor The gain factor value.

Returns:

None

Description:

Set the gain value for the particular channel. This API would set the SHS gain factor for the channel. The input voltage will get a gain proportional to the selected **gain_factor** then will be converted by the ADC.

Example Usage:

```
// Initialize the ADC_MEASUREMENT_ADV APP. Set th
e number of required channels to 2.
// Goto interrupts tab enable request source inte
rrupt.
// Goto the ADC_SCAN APP and enable the request s
ource interrupt.
// Generate the code and build.
// Replace this in the main.c.
#include <DAVE.h>                 //Declarations
from DAVE Code Generation (includes SFR declarati
on)

uint16_t result[2];
void adc_measurement_adv_callback(void)
{
  result[0] = ADC_MEASUREMENT_ADV_GetResult(&ADC_
MEASUREMENT_ADV_0_Channel_A);
  result[1] = ADC_MEASUREMENT_ADV_GetResult(&ADC_
MEASUREMENT_ADV_0_Channel_B);
}

int main(void)
{
  DAVE_STATUS_t status;

  status = DAVE_Init();           // Initializati
on of DAVE APPs

  if(status == DAVE_STATUS_FAILURE)
  {
    // Placeholder for error handler code. The wh
ile loop below can be replaced with an user error
 handler.
    XMC_DEBUG("DAVE APPs initialization failed\n"
);
```

```
    while(1U)
    {

    }
  }

  // Start the selected request source
  ADC_MEASUREMENT_ADV_StartADC(&ADC_MEASUREMENT_A
DV_0);

  // select the gain value of 12
  ADC_MEASUREMENT_ADV_SetChannelGain(&ADC_MEASURE
MENT_ADV_0_Channel_A, ADC_MEASUREMENT_ADV_GAIN_12
);

  while(1U)
  {
    // Continuously re-trigger the scan conversio
n sequence
    ADC_MEASUREMENT_ADV_SoftwareTrigger(&ADC_MEAS
UREMENT_ADV_0);
  }
}
```

Definition at line **992** of file **ADC_MEASUREMENT_ADV.c**.

References **ADC_MEASUREMENT_ADV_CHANNEL::ch_handle**, **ADC_MEASUREMENT_ADV_CHANNEL::ch_num**, and **ADC_MEASUREMENT_ADV_CHANNEL::group_index**.

ADC_MEASUREMENT_ADV_STATUS_t ADC_MEASUREMENT_ADV

Sets the fast conversion value.

Parameters:

handle_ptr	constant pointer to the channel handle structure. (Use the channel handle related macros which are defined in adc_measure_adv_conf.h)
compare_value	constant pointer to the channel handle structure.

Returns:

None

Description:

Returns the converted result stored in the result register [GxRESy.RESULT]. In the APP each channel is configured to a particular group result register. If FIFO is enabled for the particular channel this reads the fast compare result from the FIFO tail register. The result register is defined in the channel handle structure **ADC_MEASUREMENT_ADV_CHANNEL_t**. Hence this API shall call be called with a pointer to the channel handle of type **ADC_MEASUREMENT_ADV_CHANNEL_t** (Directly use the channel handle related macros which are defined in adc_measure_adv_conf.h).

Example Usage:

```
// Initialize the ADC_MEASUREMENT_ADV APP. Set th
e number of required channels to 1.
// Select the request source APP from ADC_SCAN to
 ADC_QUEUE.
// Goto the sequence plan and select Channel_A at
 position-0 and enable the refill.
// Enable Wait for trigger for the Channel_A.
// Goto interrupts tab enable result event for Ch
annel_A.
// Instantiate the interrupt APP.
// In the UI of the interrupt APP change the inte
rrupt handler to "result_event_callback"
```

```
// goto HW signal connectivity and connect event_
result_Channel_A to interrupt APP.
// Generate the code and build.
// Replace this in the main.c.
#include <DAVE.h>                 //Declarations
from DAVE Code Generation (includes SFR declarati
on)

#define MAX_LOCAL_BUFFER (16U)
ADC_MEASUREMENT_ADV_FAST_COMPARE_t result[16];
uint16_t i = 0U;

void result_event_callback(void)
{
  result[i++] = ADC_MEASUREMENT_ADV_GetFastCompar
eResult(&ADC_MEASUREMENT_ADV_0_Channel_A);
  if(MAX_LOCAL_BUFFER == i)
  {
    i = 0U;
  }
}

int main(void)
{
  DAVE_STATUS_t status;

  status = DAVE_Init();           // Initializati
on of DAVE APPs

  if(status == DAVE_STATUS_FAILURE)
  {
    // Placeholder for error handler code. The wh
ile loop below can be replaced with an user error
 handler.
    XMC_DEBUG("DAVE APPs initialization failed\n"
);
```

```
    while(1U)
    {

    }
  }

  // Set the threshold value as Vdd/2
  ADC_MEASUREMENT_ADV_SetFastCompareValue(&ADC_ME
ASUREMENT_ADV_0_Channel_A,512U);

  // Start the selected request source
  ADC_MEASUREMENT_ADV_StartADC(&ADC_MEASUREMENT_A
DV_0);

  while(1U)
  {
  // Continuously trigger the queue conversion se
quence
  ADC_MEASUREMENT_ADV_SoftwareTrigger(&ADC_MEASUR
EMENT_ADV_0);
  }
}
```

Definition at line **921** of file **ADC_MEASUREMENT_ADV.c**.

References **ADC_MEASUREMENT_ADV_STATUS_FAILURE**, **ADC_MEASUREMENT_ADV_STATUS_SUCCESS**, **ADC_MEASUREMENT_ADV_CHANNEL::ch_handle**, and **ADC_MEASUREMENT_ADV_CHANNEL::group_index**.

void ADC_MEASUREMENT_ADV_SetIclass (const ADC_MEASURE

Enables uniform conversion configurations across slaves.

Parameters:

handle_ptr constant pointer to the channel handle structure.

(Use the channel handle related macros which are defined in adc_measure_adv_conf.h)

Returns:

None

Description:

Enables uniform conversion configurations across slaves. The ADC_QUEUE configures the input class settings for the master group. When slaves need to convert the input signals at the same configuration as the master group then a call to this API is needed. A call to this API will ensure that the master and the slave channels are converting the input signals at the same resolution and sampling time.

Note:

- ADC_ADVANCE_MEASURE APP will configure the input class used by ADC_QUEUE or ADC_SCAN in the channel configuration. Thus the input class is either GxICLASS[0] or GxICLASS[1]. The slaves channels are also configured by the same input class number in the GxCHCTR.ICLSEL. A call to this API will copy the configurations from the master groups input class(GxICLASS[z]) to the slaves groups input class (GyICLASS[z], where in *x* is the master group, *y* is the slave group and *z* is the input class number which is common across master and slave).

- The channel iclass can be changed to global iclass at any time by calling runtime APIs. This API cannot support such a situation.

Example Usage:

```
// Initialize the ADC_MEASUREMENT_ADV APP. Set th
e number of required channels to 1.
// Select the request source APP from ADC_SCAN to
 ADC_QUEUE.
// Goto the sequence plan and select Channel_A at
```

```
 position-0 and enable the refill.
// Enable Wait for trigger for the Channel_A.
// Goto the Sync. Conversion tab and select the s
ynchronized groups as 1 slave.
// Goto the Sync Master check box for the Channel
_A and enable it.
// Goto interrupts tab enable request source inte
rrupt.
// Goto the ADC_QUEUE APP and enable the request
source interrupt.
// Generate the code and build.
// Replace this in the main.c.
#include <DAVE.h>                 //Declarations
from DAVE Code Generation (includes SFR declarati
on)

#define MAX_LOCAL_BUFFER (16U)
uint16_t result[16],sync_result[16];
uint16_t i = 0U;

void adc_measurement_adv_callback(void)
{
  result[i++] = ADC_MEASUREMENT_ADV_GetResult(&AD
C_MEASUREMENT_ADV_0_Channel_A);
  sync_result[i++] = ADC_MEASUREMENT_ADV_GetResult
(&ADC_MEASUREMENT_ADV_0_Channel_A_SLAVE_A);
  if(MAX_LOCAL_BUFFER == i)
  {
    i = 0U;
  }
}

int main(void)
{
  DAVE_STATUS_t status;

  status = DAVE_Init();           // Initializati
```

```
on of DAVE APPs

  if(status == DAVE_STATUS_FAILURE)
  {
    // Placeholder for error handler code. The wh
ile loop below can be replaced with an user error
 handler.
    XMC_DEBUG("DAVE APPs initialization failed\n"
);

    while(1U)
    {

    }
  }

  //Set the same conversion characteristics for t
he slave groups channels as well
  ADC_MEASUREMENT_ADV_SetIclass(&ADC_MEASUREMENT_
ADV_0);

  // Start the selected request source
  ADC_MEASUREMENT_ADV_StartADC(&ADC_MEASUREMENT_A
DV_0);

  while(1U)
  {
  }
}
```

Definition at line **1090** of file **ADC_MEASUREMENT_ADV.c**.

References **ADC_MEASUREMENT_ADV::group_index**.

void ADC_MEASUREMENT_ADV_SetSubtractionValue (const ADC

ADC_MEA
uint16_t
)

Set the subtraction value if a result difference mode is required.

Parameters:

handle_ptr	constant pointer to the APP handle structure
subtraction_alignment	The result alignment in the result register.
subtraction_value	constant value that is used for subtraction.

Returns:

None

Description:

Set the subtraction value in the result register 0 [GxRES[0].RESULT]. In the subtraction mode the result register 0 is used as the subtrahend. Any channel in the GUI which has selected the subtraction mode will have its converted value subtracted from the value stored in the result register-0. This can be used as an offset for the converted values.

Example Usage:

```
// Initialize the ADC_MEASUREMENT_ADV APP. Set the number of required channels to 2.
// Select the request source APP from ADC_SCAN to ADC_QUEUE.
// Goto the sequence plan and select Channel_A at position-0 and Channel_B at position-1.
// Enable Wait for trigger for the Channel_A.
// Goto interrupts tab enable request source interrupt.
```

```
// Goto the ADC_QUEUE APP and enable the request
source interrupt.
// Generate the code and build.
// Replace this in the main.c.
#include <DAVE.h>                 //Declarations
from DAVE Code Generation (includes SFR declarati
on)

#define VOLTAGE_OFFSET (50U)
uint16_t result[2];
void adc_measurement_adv_callback(void)
{
  result[0] = ADC_MEASUREMENT_ADV_GetResult(&ADC_
MEASUREMENT_ADV_0_Channel_A);
  result[1] = ADC_MEASUREMENT_ADV_GetResult(&ADC_
MEASUREMENT_ADV_0_Channel_B);
}

int main(void)
{
  DAVE_STATUS_t status;

  status = DAVE_Init();           // Initializati
on of DAVE APPs

  if(status == DAVE_STATUS_FAILURE)
  {
    // Placeholder for error handler code. The wh
ile loop below can be replaced with an user error
 handler.
    XMC_DEBUG("DAVE APPs initialization failed\n"
);

    while(1U)
    {

    }
```

```
  }

  // Start the selected request source
  ADC_MEASUREMENT_ADV_StartADC(&ADC_MEASUREMENT_A
DV_0);

  ADC_MEASUREMENT_ADV_SetSubtractionValue(&ADC_ME
ASUREMENT_ADV_0,ADC_MEASUREMENT_ADV_SUBTRATION_12
BIT_RIGHT_ALIGN,
                                           VOLTAG
E_OFFSET);

  // Start the queue conversion sequence
  ADC_MEASUREMENT_ADV_SoftwareTrigger(&ADC_MEASUR
EMENT_ADV_0);

  while(1U)
  {
  }
}
```

Definition at line **941** of file **ADC_MEASUREMENT_ADV.c**.

References **ADC_MEASUREMENT_ADV::group_index**.

void ADC_MEASUREMENT_ADV_SoftwareTrigger (const ADC_ME

Starts the conversion of the required channels.

Parameters:

handle_ptr constant pointer to the APP handle structure

Returns:

None

Description:

Trigger a load event for the required channels thus starting the conversion of the ADC channels. If scan request source is selected then this API would write to GxASMR.LDEV bit, causing the conversion to start. If queue request source is selected then this API would write to GxQMR0.TREV bit. At the time of writing to TREV bit for the queue. If there was queue entry waiting in the queue buffer for a hardware trigger, writing to TREV bit triggers the conversion for that entry.

Example Usage:

```
// Initialize the ADC_MEASUREMENT_ADV APP. Set th
e number of required channels to 2.
// Goto interrupts tab enable request source inte
rrupt.
// Goto the ADC_SCAN/ADC_QUEUE APP and enable the
 request source interrupt.
// Generate the code and build.
// Replace this in the main.c.
#include <DAVE.h>                 //Declarations
from DAVE Code Generation (includes SFR declarati
on)

uint16_t result[2];
void adc_measurement_adv_callback(void)
{
  result[0] = ADC_MEASUREMENT_ADV_GetResult(&ADC_
MEASUREMENT_ADV_0_Channel_A);
  result[1] = ADC_MEASUREMENT_ADV_GetResult(&ADC_
MEASUREMENT_ADV_0_Channel_B);
}

int main(void)
{
  DAVE_STATUS_t status;

  status = DAVE_Init();           // Initializati
```

```
on of DAVE APPs

  if(status == DAVE_STATUS_FAILURE)
  {
    // Placeholder for error handler code. The wh
ile loop below can be replaced with an user error
 handler.
    XMC_DEBUG("DAVE APPs initialization failed\n"
);

    while(1U)
    {

    }
  }

  // Start the selected request source
  ADC_MEASUREMENT_ADV_StartADC(&ADC_MEASUREMENT_A
DV_0);

  while(1U)
  {
    // Continuously re-trigger the scan conversio
n sequence
    ADC_MEASUREMENT_ADV_SoftwareTrigger(&ADC_MEAS
UREMENT_ADV_0);
  }
}
```

Definition at line **718** of file **ADC_MEASUREMENT_ADV.c**.

References **ADC_MEASUREMENT_ADV::group_index**, and **ADC_MEASUREMENT_ADV::req_src**.

void ADC_MEASUREMENT_ADV_StartADC (const ADC_MEASURE

Starts the VADC request source.

Parameters:

handle_ptr constant pointer to the APP handle structure

Returns:

None

Description:

This API would start the request source of the VADC. After this API is invoked the ADC is ready for accepting conversion requests. If scan request source is selected then this API would write to GxARBPR.ASEN1 bit. If queue request source is selected then this API would write to GxARBPR.ASEN0 bit. At the time of writing to ASEN0 bit for the queue, If there was queue entry waiting in the queue buffer without waiting for a hardware trigger, this API would start the conversion of such a queue.

Example Usage:

```
// Initialize the ADC_MEASUREMENT_ADV APP. Set th
e number of required channels to 2.
// Goto interrupts tab enable request source inte
rrupt.
// Goto the ADC_SCAN/ADC_QUEUE APP and enable the
 request source interrupt.
// Generate the code and build.
// Replace this in the main.c.
#include <DAVE.h>                 //Declarations
from DAVE Code Generation (includes SFR declarati
on)

uint16_t result[2];
void adc_measurement_adv_callback(void)
{
```

```
  result[0] = ADC_MEASUREMENT_ADV_GetResult(&ADC_
MEASUREMENT_ADV_0_Channel_A);
  result[1] = ADC_MEASUREMENT_ADV_GetResult(&ADC_
MEASUREMENT_ADV_0_Channel_B);
}

int main(void)
{
  DAVE_STATUS_t status;

  status = DAVE_Init();           // Initializati
on of DAVE APPs

  if(status == DAVE_STATUS_FAILURE)
  {
    // Placeholder for error handler code. The wh
ile loop below can be replaced with an user error
 handler.
    XMC_DEBUG("DAVE APPs initialization failed\n"
);

    while(1U)
    {

    }
  }

  // Start the selected request source
  ADC_MEASUREMENT_ADV_StartADC(&ADC_MEASUREMENT_A
DV_0);

  while(1U)
  {
    // Continuously re-trigger the scan conversio
n sequence
    ADC_MEASUREMENT_ADV_SoftwareTrigger(&ADC_MEAS
UREMENT_ADV_0);
```

```
    }
}
```

Definition at line **695** of file **ADC_MEASUREMENT_ADV.c**.

References **ADC_MEASUREMENT_ADV::group_index**, and **ADC_MEASUREMENT_ADV::req_src**.

Referenced by **ADC_MEASUREMENT_ADV_Init()**.

ADC_MEASUREMENT_ADV

Usage

Usage

The following examples demonstrate some of the use cases of the **ADC_MEASUREMENT_ADV** APP.

1. **Example to illustrate the autoscan mode (Software start continuous mode).**
2. **Example to illustrate the software triggered conversions (Software start single shot mode).**
3. **Example to illustrate the hardware triggered conversions (Hardware trigger single shot mode).**
4. **Example to illustrate synchronous conversions.**

Use case 1: The use case illustrates the use of the "autoscan mode" (continuous conversion). An API call starts the conversion round. After one conversion round (2 Channels) the round is automatically repeated. Hence no additional start of the conversion round is necessary. The result is cautiously read in the main loop.
In this example the "ADC_SCAN_APP" is used. See following configuration.
Note: The conversion result is read continuously and it is independent of ADC result being ready.

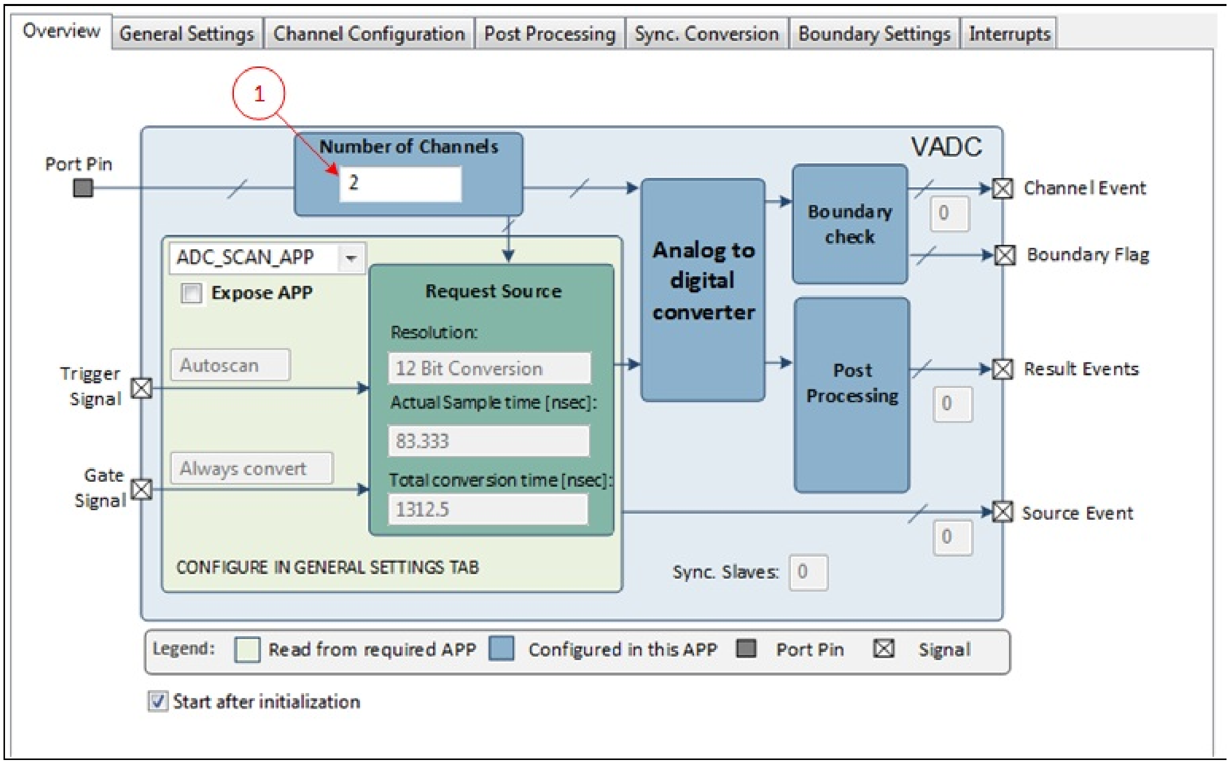
The use case can also be handled with "ADC_QUEUE_APP" by disabling all "Wait for trigger" in the "Sequence Plan" tab.
Note: This configuration will immediately start the conversion after the ADC start (GUI checkbox "Start after initialization" or API for start ADC). This use case is not shown in this example.

Instantiate the required APPs

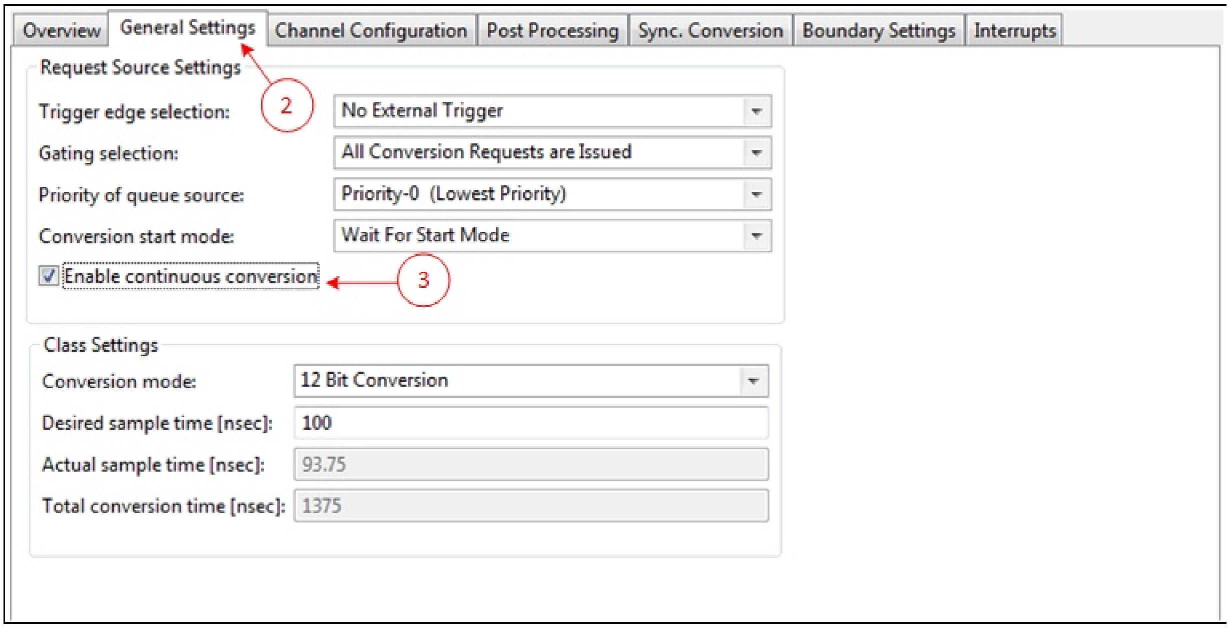
Drag an instance of **ADC_MEASUREMENT_ADV** APP. Update the fields in the GUI of the APP with the following configuration.

Configure the APP:
ADC_MEASUREMENT_ADV_0 APP:

1. Set the number of channels to 2 .

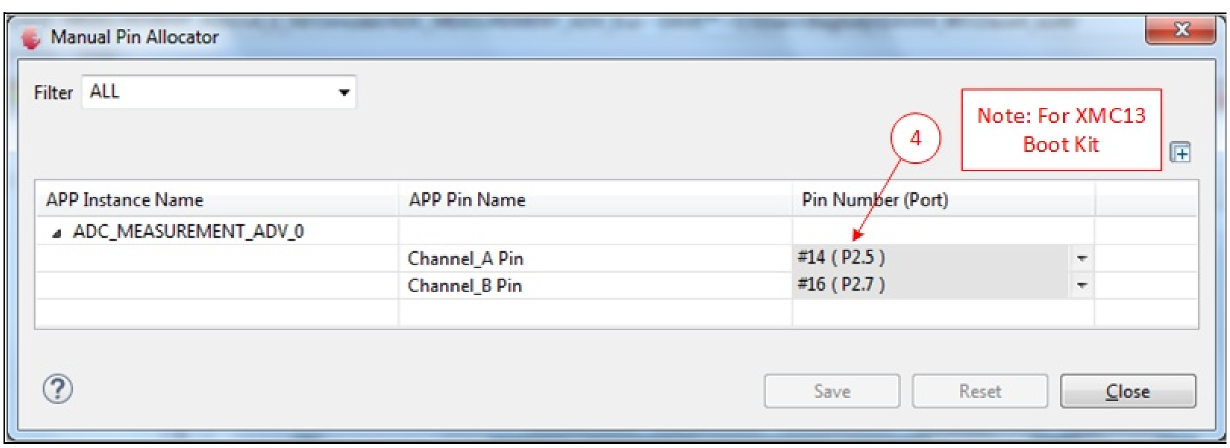


2. Goto General settings Tab.
3. Check the "Enable continuous Conversion" check box.



Manual pin allocation

4. Select the potentiometer Pin present in the boot kit and also another pin in available for the select board.
   Note: The pin number is specific to the development board chosen to run this example. The pin shown in the image above may not be available on every XMC boot kit. Ensure that a proper pin is selected according to the board.



Generate code

Files are generated here: '<project_name>/Dave/Generated/' ('project_name' is the name chosen by the user during project creation). APP instance definitions and APIs are generated only after code generation.

- **Note:** Code must be explicitly generated for every change in the GUI configuration.
  Important: Any manual modification to the APP specific generated files will be overwritten by a subsequent code generation operation.

Sample Application (main.c)

```
 #include <DAVE.h>                 //Declarations
from DAVE Code Generation (includes SFR declaratio
n)


 int main(void)
 {
   DAVE_STATUS_t status;
   uint16_t resultA, resultB;

   status = DAVE_Init();           /* Initializati
on of DAVE APPs  */

   if(status == DAVE_STATUS_FAILURE)
   {
     /* Placeholder for error handler code. The wh
ile loop below can be replaced with an user error
handler. */
     XMC_DEBUG("DAVE APPs initialization failed\n"
);

     while(1U)
     {
```

```
    }
  }

  // One Software trigger to start the conversion
 of the 2 channels.
  // After each conversion round(i.e after 2 chan
nels) the conversion will be automatically repeate
d.
  ADC_MEASUREMENT_ADV_SoftwareTrigger(&ADC_MEASUR
EMENT_ADV_0);
  while(1U)
  {
    //continuously read the result value.
    //NOTE: The result read doesn't wait for the
new result to be ready.
    resultA = ADC_MEASUREMENT_ADV_GetResult(&ADC_
MEASUREMENT_ADV_0_Channel_A);
    resultB = ADC_MEASUREMENT_ADV_GetResult(&ADC_
MEASUREMENT_ADV_0_Channel_B);
    XMC_UNUSED_ARG(resultA);
    XMC_UNUSED_ARG(resultB);
  }
 }
```

Build and Run the Project

Observation
The measurement is started with the **ADC_MEASUREMENT_ADV_SoftwareTrigger()** API call. The conversion results are read continuously and stored in "resultA" and "resultB" variable.

Use case 2:
The use case illustrates the software triggered conversions. In this use case a sequence of 2 ADC Channels will be converted. The conversion round is started with an API. After one conversion round (2 Channels)

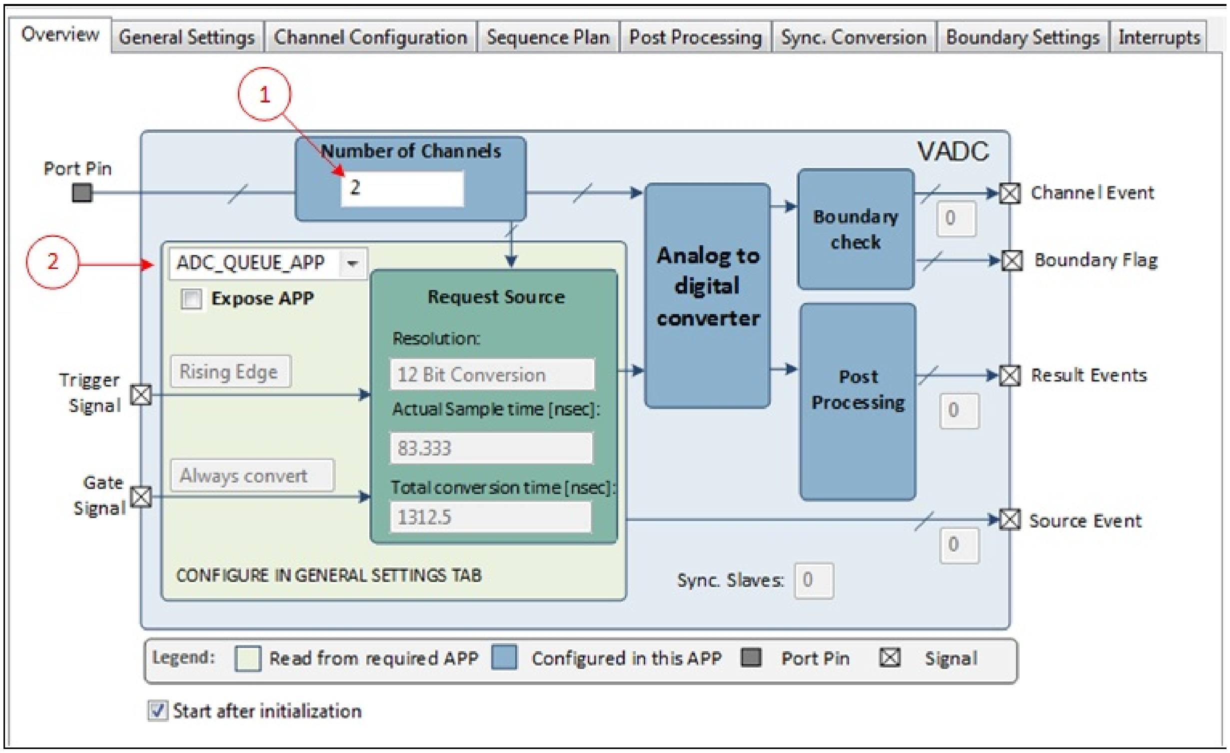
the conversion is stopped and waits for the next software start. After each conversion round a result event is generated and the ADC results are read in the ISR. After the results have been read, a new conversion is started with an API call.
In this example the "ADC_QUEUE_APP" is used. See following configuration.

The use case can also be handled with "ADC_SCAN_APP". This use case is not shown in this example.
Note: This usecase uses an INTERRUPT APP for the result events. For those configurations refer to INTERRUPT APP help.
Note: In "ADC_SCAN_APP" the conversion sequence depends on the channels consumed. If Channel_A consumes a lower channel number than Channel_B then Channel_B would be converted first. Hence care needs to be taken when a similar setup is done while using ADC_SCAN_APP.

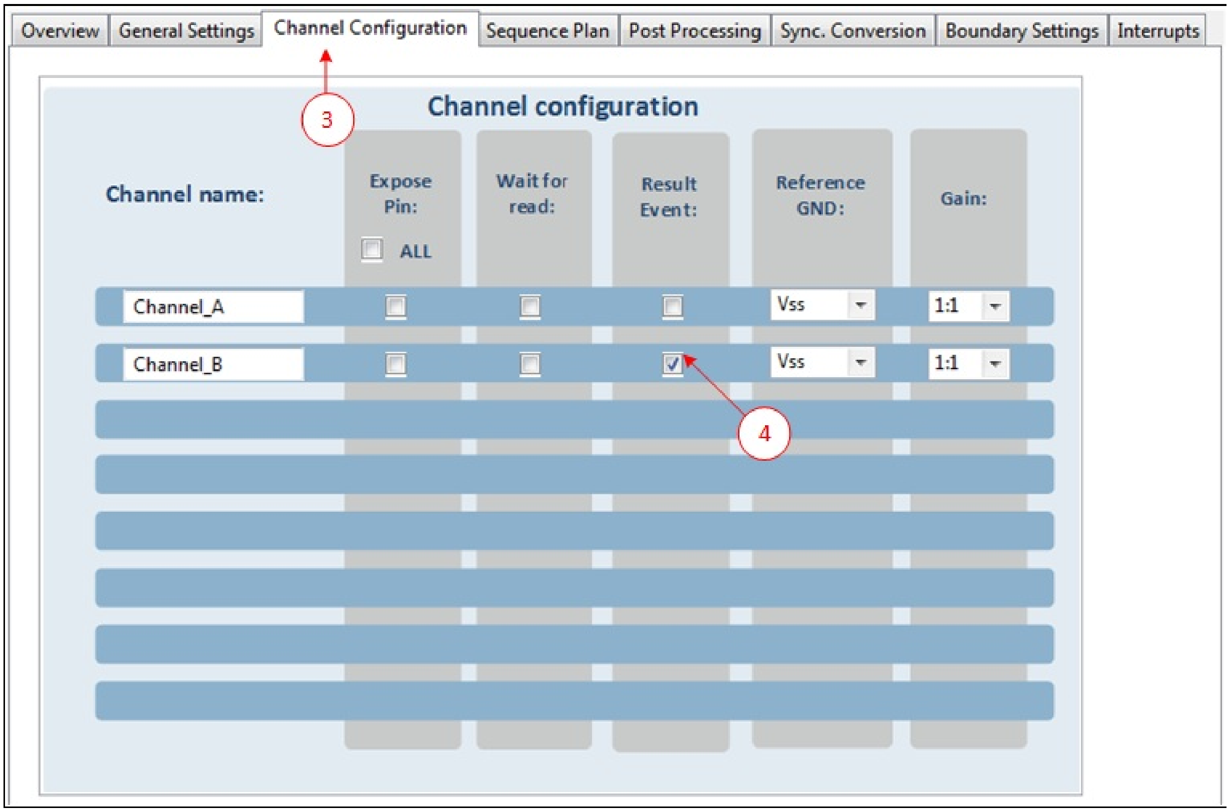
Instantiate the required APPs
Drag an instance of **ADC_MEASUREMENT_ADV** APP and one instance of INTERRUPT APP. Update the fields in the GUI of the APP with the following configuration.

Configure the APP:
ADC_MEASUREMENT_ADV_0 APP:

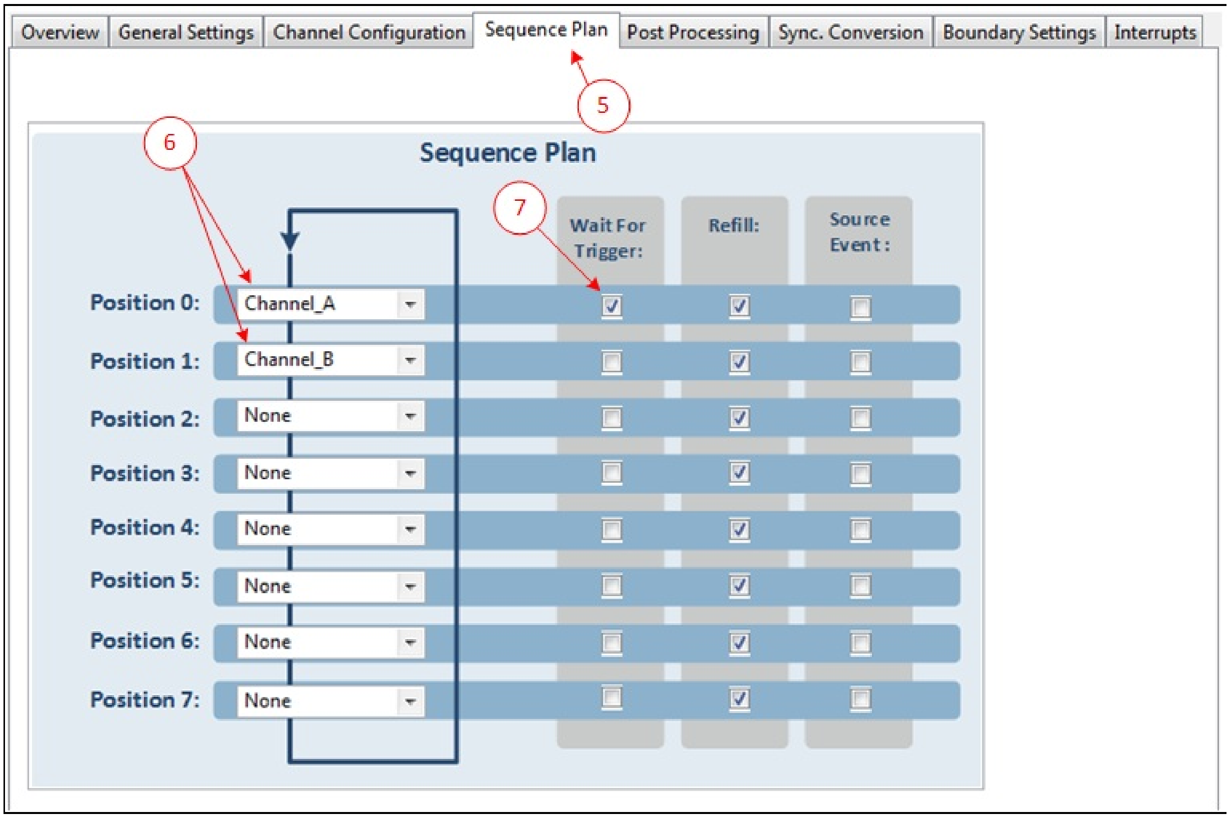
1. Set the number of channels to 2 .
2. Select the request source as ADC_QUEUE_APP .



3. Goto Channel configuration Tab.
4. Enable the result event for Channel_B.

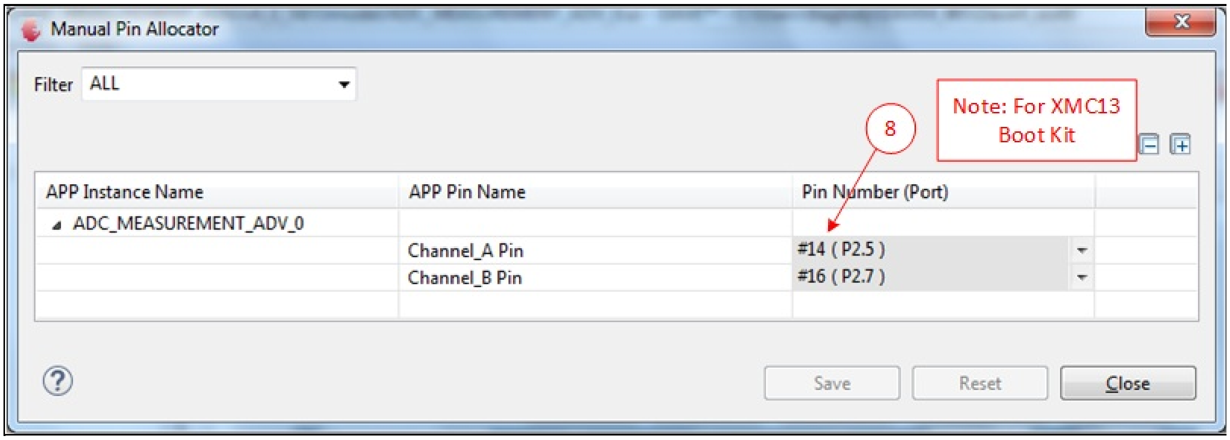


5. Goto Sequence Plan Tab.
6. Select the Queue Position-0 as Channel-A, Position-1 as Channel_B.
7. Select "Wait for Trigger" for Channel-A.



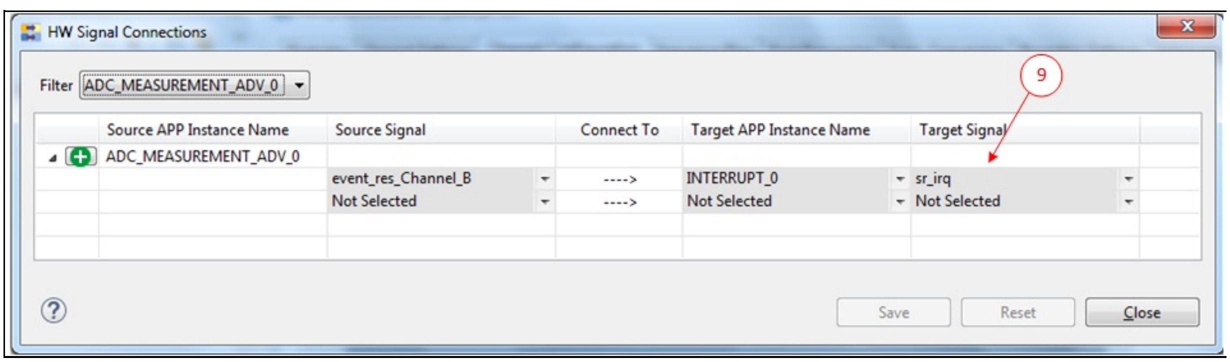
Manual pin allocation

8. Select the potentiometer Pin present in the boot kit and also another pin in available for the select board.
   Note: The pin number is specific to the development board chosen to run this example. The pin shown in the image above may not be available on every XMC boot kit. Ensure that a proper pin is selected according to the board.



HW Signal Connections

9. Connect the ADC_MEASUREMENT_ADV_0 event_res_Channel_B signal to INTERRUPT_0 sr_irq



Generate code

Files are generated here: '<project_name>/Dave/Generated/' ('project_name' is the name chosen by the user during project creation). APP instance definitions and APIs are generated only after code generation.

- **Note:** Code must be explicitly generated for every change in the GUI configuration.
  Important: Any manual modification to the APP specific generated files will be overwritten by a subsequent code generation operation.

Sample Application (main.c)

```
 #include <DAVE.h>                 //Declarations
from DAVE Code Generation (includes SFR declaratio
n)

 uint16_t resultA,resultB;

 // Result event for Channel_B
 void UserIRQHandler(void)
 {
       // read the results of the conversion
       resultA = ADC_MEASUREMENT_ADV_GetResult(&AD
C_MEASUREMENT_ADV_0_Channel_A);
       resultB = ADC_MEASUREMENT_ADV_GetResult(&AD
C_MEASUREMENT_ADV_0_Channel_B);

       //Start the next round of conversion
       ADC_MEASUREMENT_ADV_SoftwareTrigger(&ADC_ME
ASUREMENT_ADV_0);
 }

 int main(void)
 {
   DAVE_STATUS_t status;

   status = DAVE_Init();           /* Initializati
on of DAVE APPs  */


   if(status == DAVE_STATUS_FAILURE)
   {
     /* Placeholder for error handler code. The wh
ile loop below can be replaced with an user error
handler. */
     XMC_DEBUG("DAVE APPs initialization failed\n"
```

```
);

     while(1U)
     {

     }
   }

   // One Software trigger to start the conversion
 of the 2 channels.
   ADC_MEASUREMENT_ADV_SoftwareTrigger(&ADC_MEASUR
EMENT_ADV_0);
   while(1U)
   {

   }
 }
```

Build and Run the Project

Observation
The measurement is started with the **ADC_MEASUREMENT_ADV_SoftwareTrigger()** API call. After Channel_B is converted an event is triggered and executes the ISR UserIRQHandler(). In this ISR the results of Channel_A and Channel_B are stored in "resultA" and "resultB" variables. The API call ADC_MEASUREMENT_ADV_SoftwareTrigger(&ADC_MEASUREMENT in the ISR starts a new conversion round.

Use case 3:
The use case illustrates hardware triggered conversions. A hardware trigger starts the conversion round of 3 Channels. When the conversion round is finished a source interrupt is executed. In the ISR the results are read. The ADC waits now for a new hardware trigger.

In this example the "ADC_QUEUE_APP" is used, this allows a user defined sequence. See following configuration.

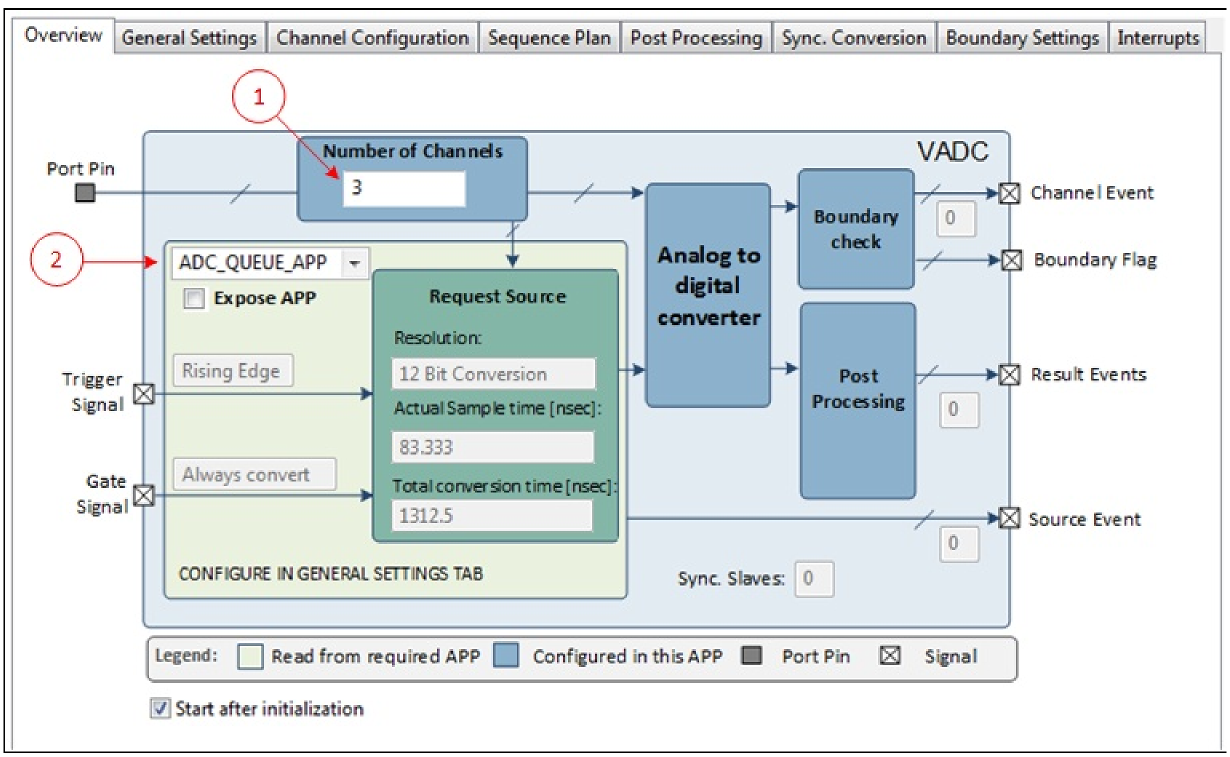
The use case can also be handled with "ADC_SCAN_APP". In that case it is mandatory to disable the "autoscan mode". Also the "result event" can be used to read the ADC results. Both the use cases are not handled in this example.

Note: The 10kHz hardware trigger is generated with a PWM APP.For PWM configuration refer to the PWM APP help.

Instantiate the required APPs
Drag an instance of **ADC_MEASUREMENT_ADV** APP and one instance of PWM APP. Update the fields in the GUI of the APP with the following configuration.

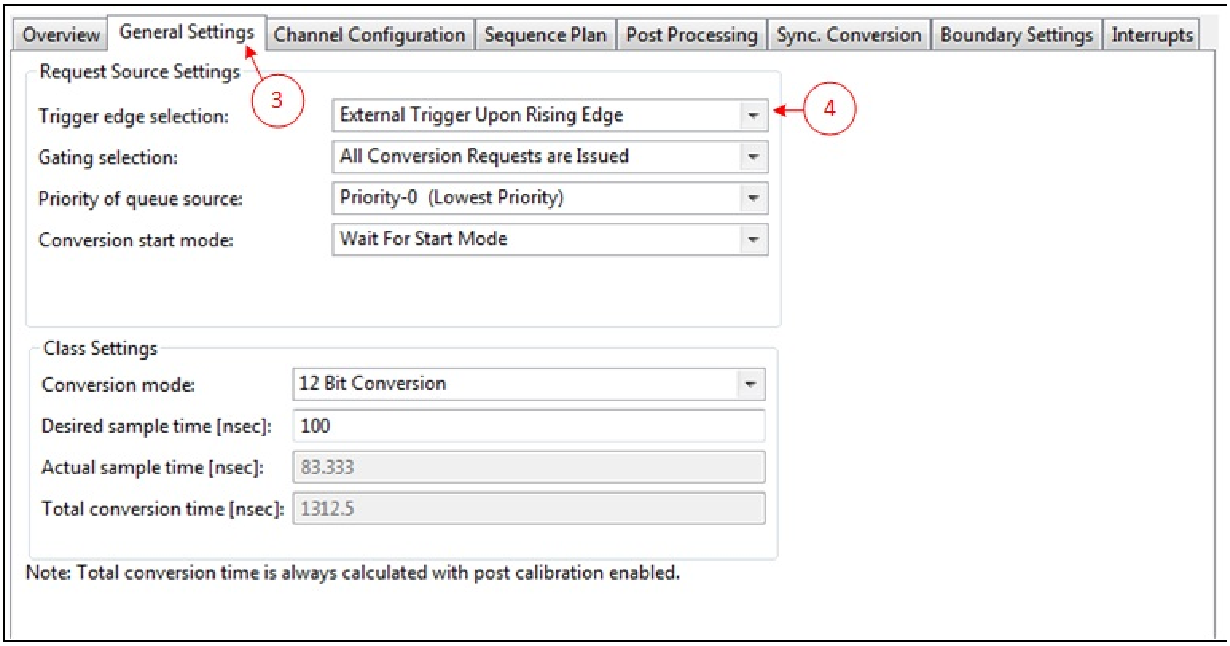
Configure the APP:
ADC_MEASUREMENT_ADV_0 APP:

1. Set the number of channels to 3 .
2. Set the request source to ADC_QUEUE_APP .

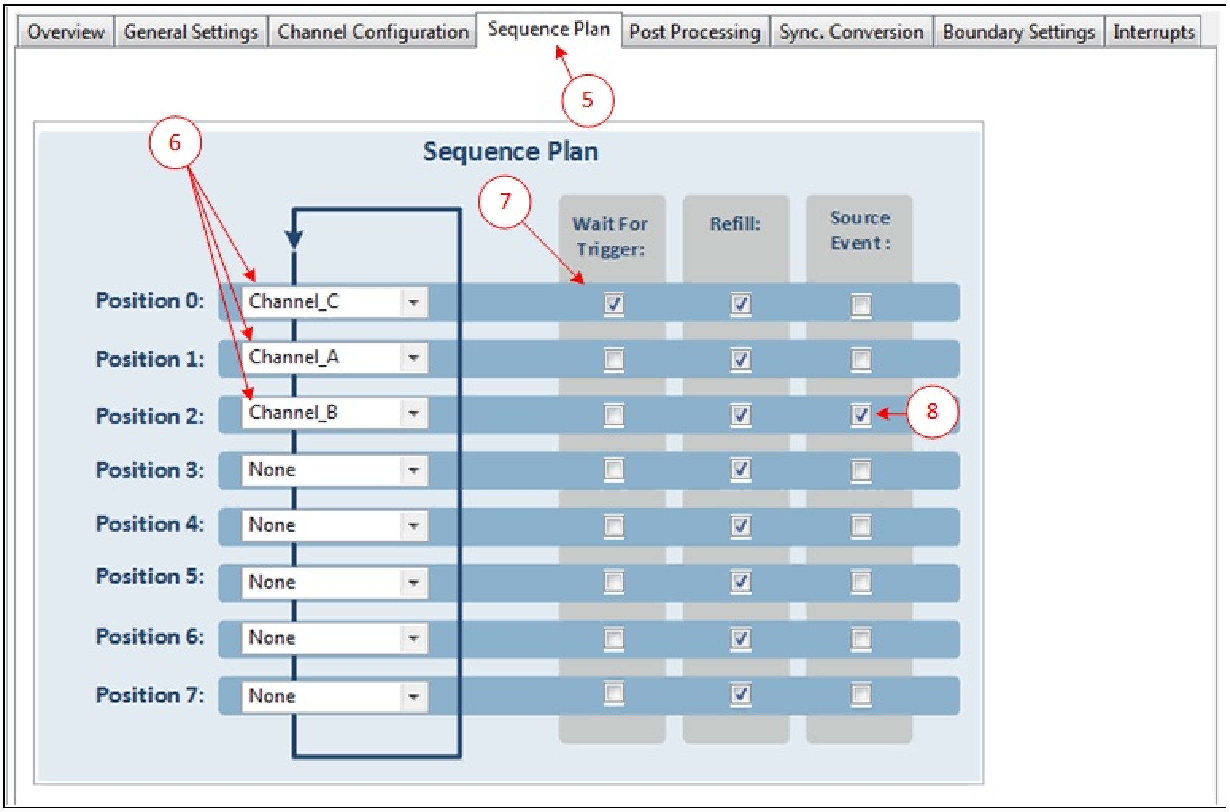


3. Goto General Settings Tab.

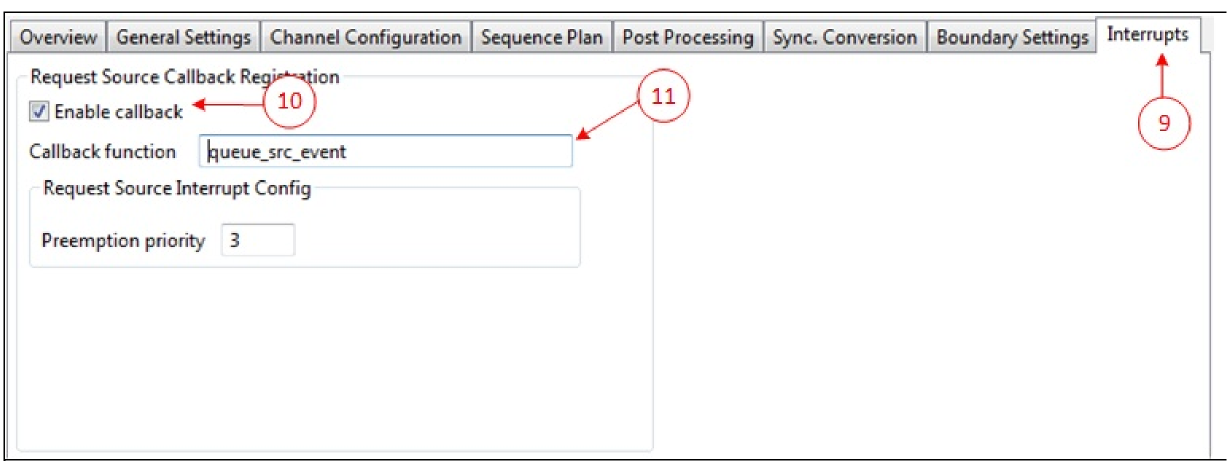
4. Select the Trigger edge as Rising Edge.



5. Goto Sequence Plan Tab.
6. Select the Queue Position-0 as Channel-C, Position-1 as Channel-A, Position-2 as Channel_B.
7. Select "Wait for Trigger" for Channel-C.
8. Select "Source Event" for Channel-B.



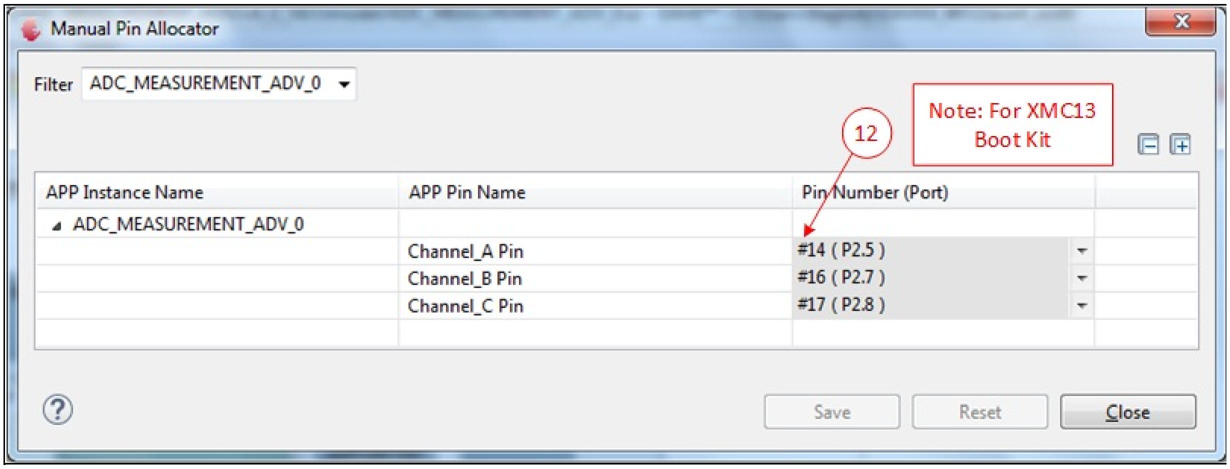
9. Goto Interrupts Tab.
10. Check the "Enable callback" check box.
11. Change the Callback function to queue_src_event.



Manual pin allocation

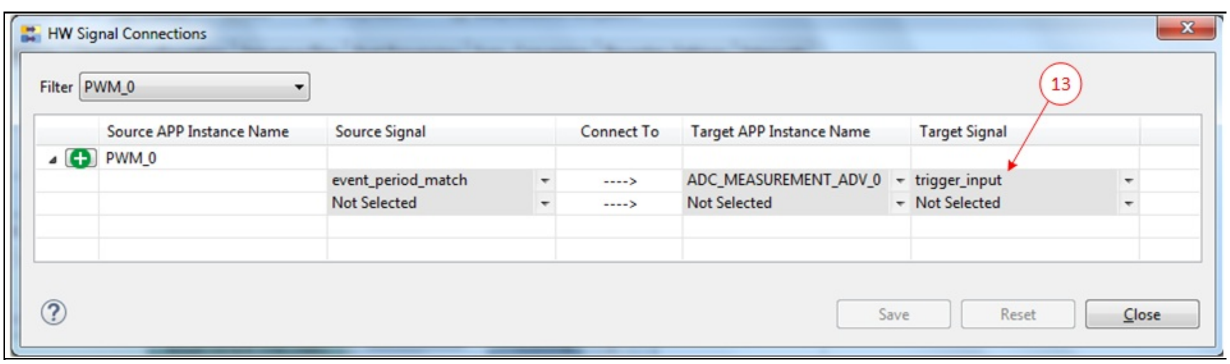
12. Select the potentiometer Pin present in the boot kit and also the

other pins which are available for the select board.
Note: The pin number is specific to the development board chosen to run this example. The pin shown in the image above may not be available on every XMC boot kit. Ensure that a proper pin is selected according to the board.



HW Signal Connections

5. Connect the PWM_0 event_period_match signal to ADC_MEASUREMENT_ADV_0 trigger_input.
   Note: Ensure that the period match event in the PWM_0 is enabled.



Generate code

Files are generated here: '<project_name>/Dave/Generated/' ('project_name' is the name chosen by the user during project creation).

APP instance definitions and APIs are generated only after code generation.

- **Note:** Code must be explicitly generated for every change in the GUI configuration.
  Important: Any manual modification to the APP specific generated files will be overwritten by a subsequent code generation operation.

Sample Application (main.c)

```
 #include <DAVE.h>                 //Declarations
from DAVE Code Generation (includes SFR declaratio
n)

 uint16_t resultA,resultB,resultC;

 // Request source event for Channel_B
 void queue_src_event(void)
 {
   // read the results of the conversion
   resultA = ADC_MEASUREMENT_ADV_GetResult(&ADC_ME
ASUREMENT_ADV_0_Channel_A);
   resultB = ADC_MEASUREMENT_ADV_GetResult(&ADC_ME
ASUREMENT_ADV_0_Channel_B);
   resultC = ADC_MEASUREMENT_ADV_GetResult(&ADC_ME
ASUREMENT_ADV_0_Channel_C);
 }

 int main(void)
 {
   DAVE_STATUS_t status;

   status = DAVE_Init();           /* Initializati
on of DAVE APPs  */
```

```
   if(status == DAVE_STATUS_FAILURE)
   {
     /* Placeholder for error handler code. The wh
ile loop below can be replaced with an user error
handler. */
     XMC_DEBUG("DAVE APPs initialization failed\n"
);

     while(1U)
     {

     }
   }

   // Start the PWM trigger.
   PWM_Start(&PWM_0);
   while(1U)
   {

   }
 }
```

Build and Run the Project

Observation
The measurement is started after initialization and waits for a hardware trigger. With a hardware trigger Channel_C, Channel_A and Channel_B are converted in this sequence. The source event for Channel_B is enabled and execute the ISR queue_src_event(void). In this ISR the results of Channel_A, Channel_B and Channel_C are stored in "resultA", "resultB" and "resultC" variables. A new sequence is started with the next hardware trigger

---

Use case 4:
The use case illustrates synchronous conversions.
The synchronous conversion is used when one or more slaves are

busy while the master starts a request. In this case the master group cancel the slave group conversion, wait until all slaves are ready and starts a conversion. This provides an exact synchronous conversion.

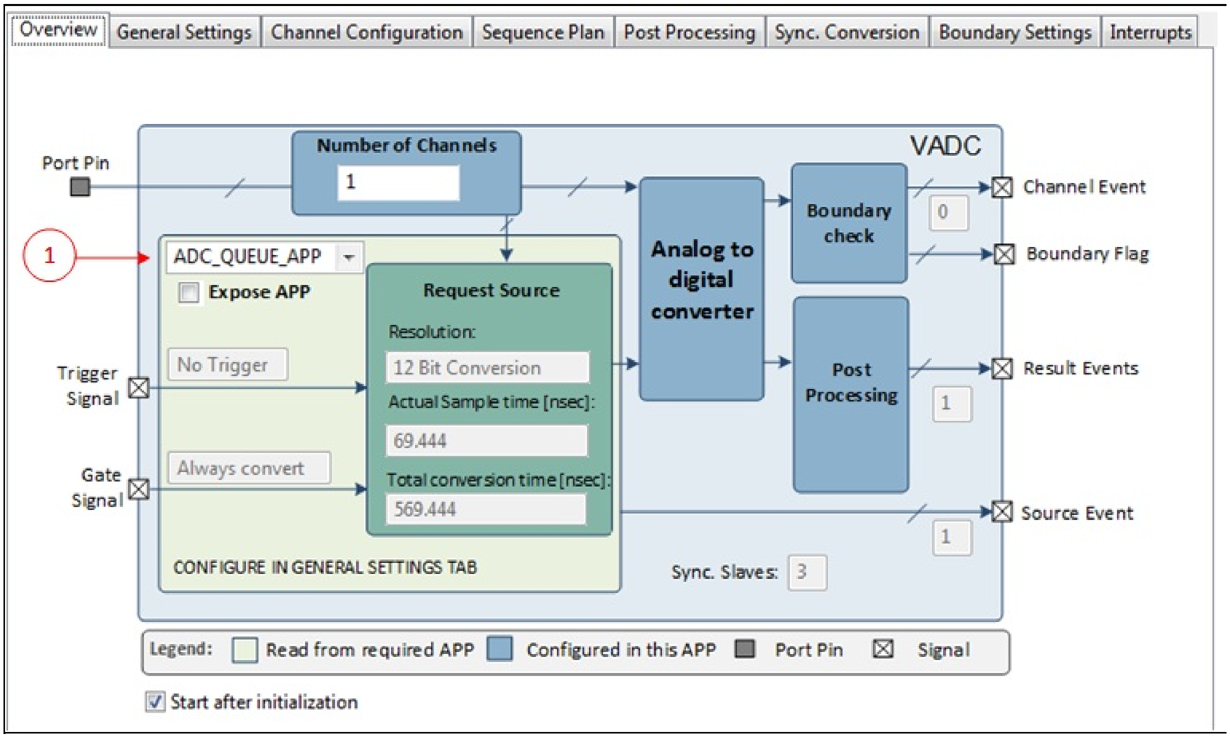
In this use case one **ADC_MEASUREMENT_ADV** APPs are used. The APP is used to configure the master which is controlled by a hardware trigger. The result event of the master is generating an interrupt where both results are read.

The **ADC_MEASUREMENT_ADV** APP for master is using the "ADC_QUEUE_APP" with a hardware trigger input. A Sync. Conversion with one slave is configured, see following configuration. The **ADC_MEASUREMENT_ADV** APP for master is triggered by a hardware trigger. **See** Use Case 3 **for configuration.**

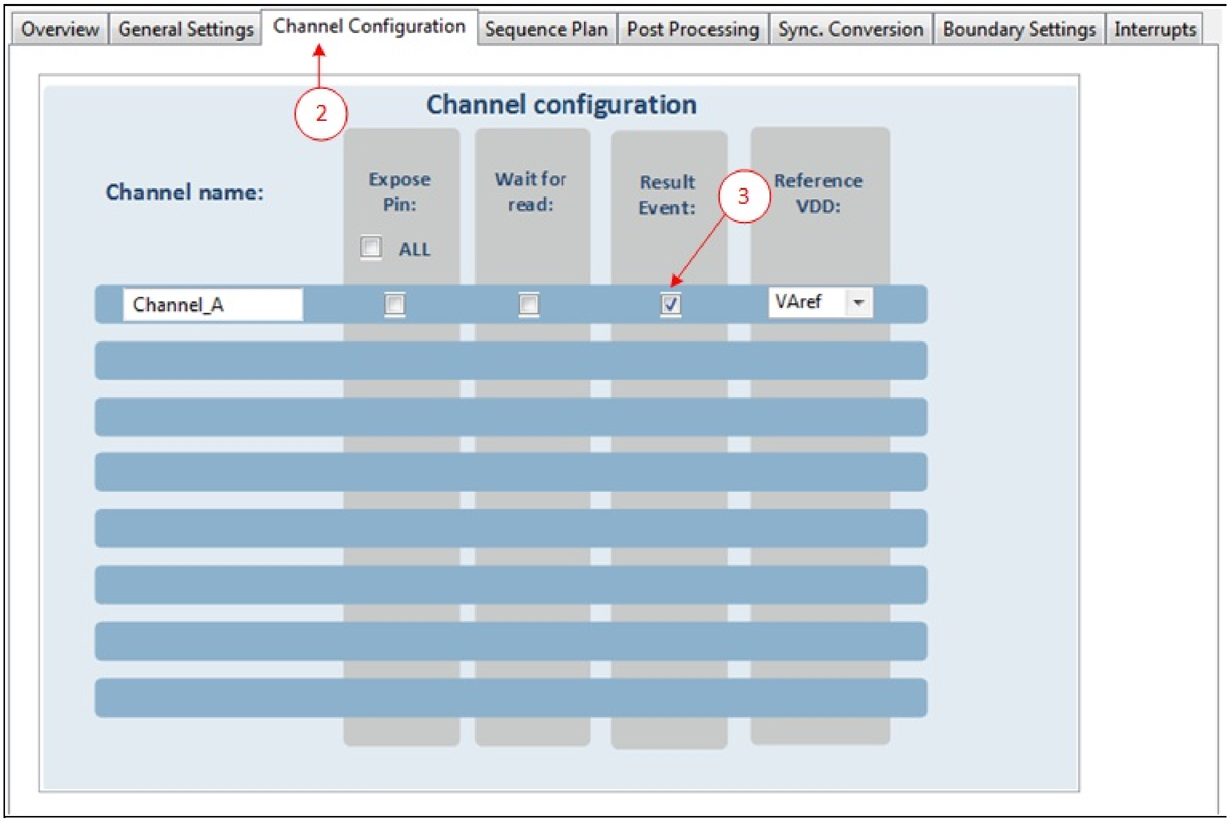
Instantiate the required APPs
Drag an instance of **ADC_MEASUREMENT_ADV** APP, one instance of PWM APP and INTERRUPT APP. Update the fields in the GUI of the APP with the following configuration.

Configure the APP:
ADC_MEASUREMENT_ADV_0 APP:

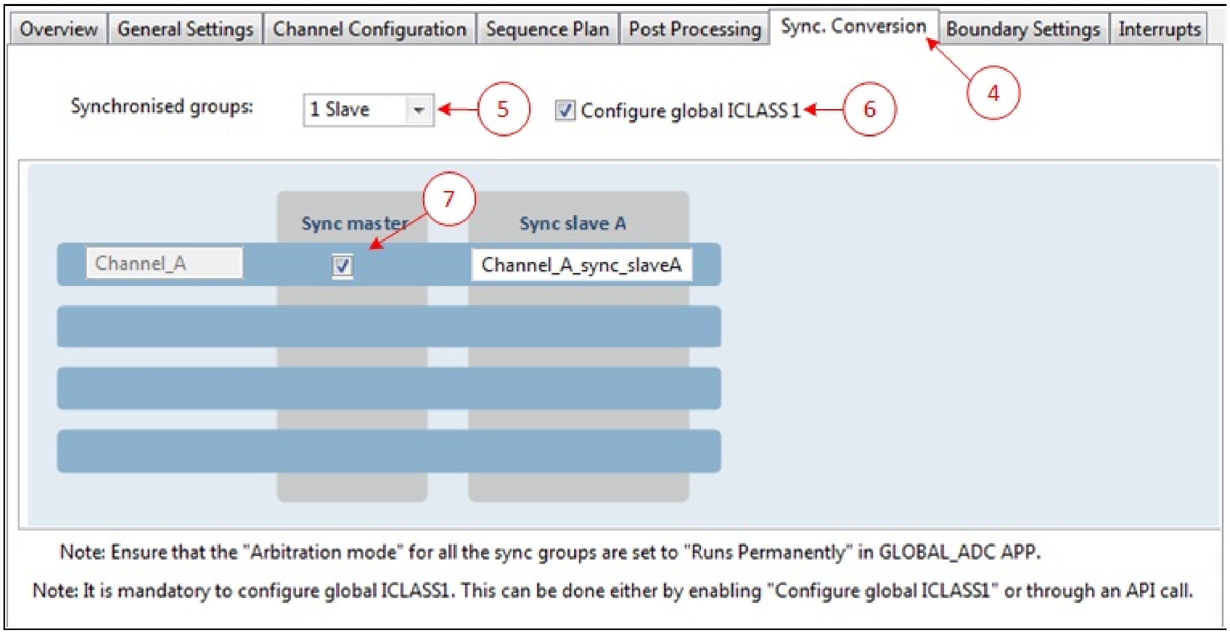
1. Set the request source to ADC_QUEUE_APP .



2. Goto Channel configuration Tab.
3. Enable the result event for the Channel_A.

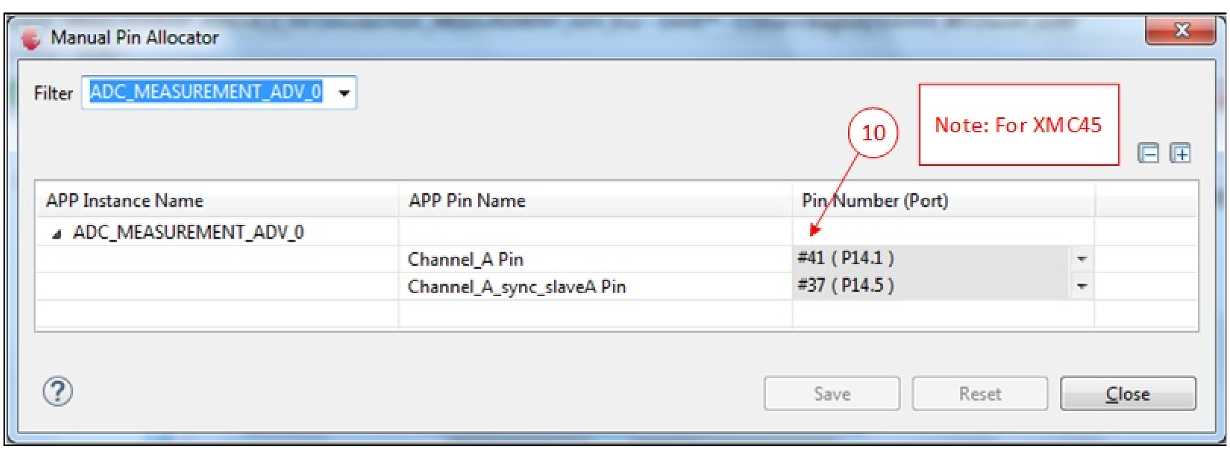


9. Goto Sync. conversion Tab.
10. Select the synchronized groups to "1 Slaves" .
11. Enable the Configure global ICLASS-1.
12. Enable the sync master checkbox for Channel_A.



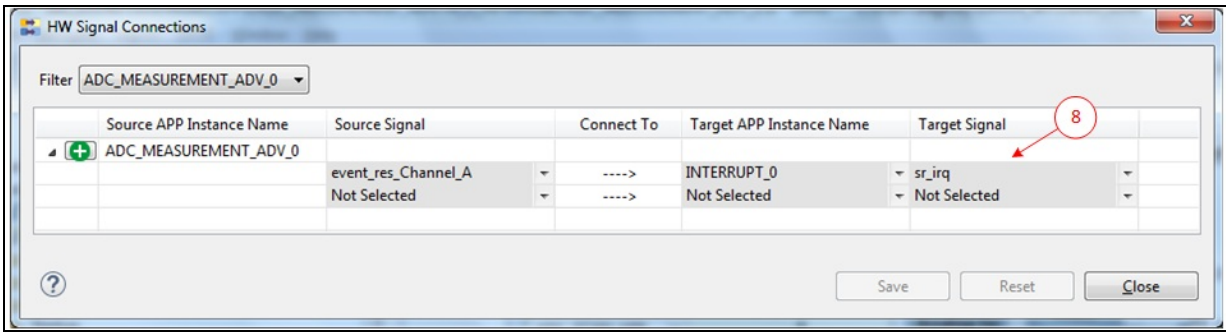
Manual pin allocation

12. Select the potentiometer Pin present in the boot kit and also the other pins which are available for the select board.
    Note: The pin number is specific to the development board chosen to run this example. The pin shown in the image above may not be available on every XMC boot kit. Ensure that a proper pin is selected according to the board.

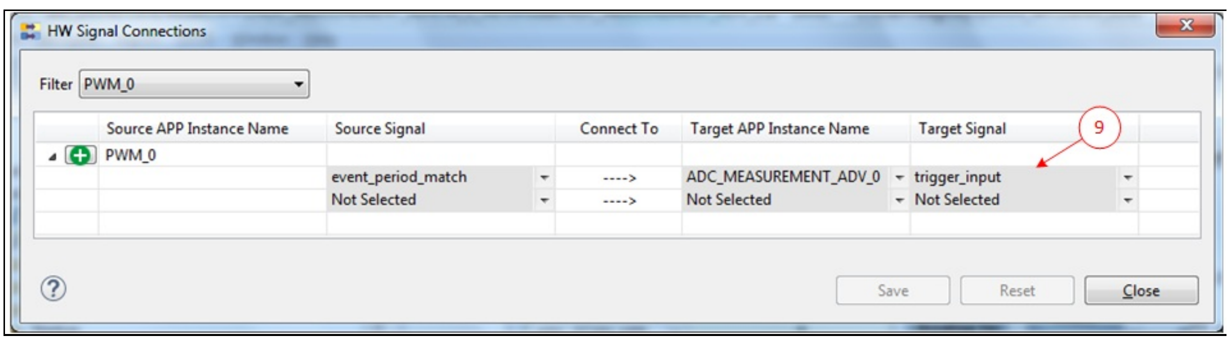


HW Signal Connections

5. Connect the PWM_0 event_period_match signal to ADC_MEASUREMENT_ADV_0 trigger_input.
   Note: Ensure that the event_period_match in the PWM_0 is enabled.



5. Connect the ADC_MEASUREMENT_ADV_0 event_res_Channel_A signal to INTERRUPT_0 sr_irq.



Generate code
Files are generated here: '<project_name>/Dave/Generated/' ('project_name' is the name chosen by the user during project creation). APP instance definitions and APIs are generated only after code generation.

- **Note:** Code must be explicitly generated for every change in the GUI configuration.
  Important: Any manual modification to the APP specific generated files will be overwritten by a subsequent code generation operation.

Sample Application (main.c)

```
 #include <DAVE.h>                 //Declarations
from DAVE Code Generation (includes SFR declaratio
n)

 uint16_t resultA,result_slaveA,result_slaveB,resu
lt_slaveC;

 // Result event for Channel_A
 void UserIRQHandler(void)
 {
   // read the results of the conversion
   resultA = ADC_MEASUREMENT_ADV_GetResult(&ADC_ME
ASUREMENT_ADV_0_Channel_A);
   result_slaveA = ADC_MEASUREMENT_ADV_GetResult(&
ADC_MEASUREMENT_ADV_0_Channel_A_sync_slaveA);
 }

 int main(void)
 {
   DAVE_STATUS_t status;

   status = DAVE_Init();           /* Initializati
on of DAVE APPs  */


   if(status == DAVE_STATUS_FAILURE)
   {
     /* Placeholder for error handler code. The wh
ile loop below can be replaced with an user error
handler. */
     XMC_DEBUG("DAVE APPs initialization failed\n"
);

     while(1U)
```

```
      {

      }
    }

    // start the trigger signal for the ADC_MEASURE
MENT_ADV_0
    PWM_Start(&PWM_0);

    while(1U)
    {

    }
  }
```

Build and Run the Project

Observation

The voltage at sync pins are converted for each rising edge of the PWM signal. The conversion results are stored in "resultA" and "result_slaveA"variables.

ADC_MEASUREMENT_ADV

Release History

Release History

ADC_MEASUREMENT_ADV

Data Structures

Here are the data structures with brief descriptions:

ADC_MEASUREMENT_ADV	
ADC_MEASUREMENT_ADV_CHANNEL	
ADC_MEASUREMENT_ADV_NVIC_CONFIG	NVIC Configuration structure for request source interrupt
ADC_MEASUREMENT_ADV_QUEUE	Configuration Data structure of queue request source
ADC_MEASUREMENT_ADV_SCAN	Configuration Data structure of scan request source

ADC_MEASUREMENT_ADV

ADC_MEASUREMENT_ADV Struct Reference

Detailed Description

Structure to configure **ADC_MEASUREMENT_ADV** APP.

Definition at line **286** of file **ADC_MEASUREMENT_ADV.h**.

```
#include <ADC_MEASUREMENT_ADV.h>
```

Data Fields

const **ADC_MEASUREMENT_ADV_CHANNEL_t** **const	**channel_array**
ADC_MEASUREMENT_ADV_EVENT_CONFIG_t	**event_config**
ADC_MEASUREMENT_ADV_STATUS_t *	**init_state**
ADC_MEASUREMENT_ADV_REQUEST_SOURCE_t	**req_src**
const uint8_t	**group_index**
const uint8_t	**total_number_**
const uint8_t	**total_number_**
const bool	**start_at_initial**
const bool	**configure_glol**
const ADC_SCAN_ENTRY_t **const	**scan_entries**
const ADC_QUEUE_ENTRY_t **const	**queue_entries**
const XMC_VADC_QUEUE_ENTRY_t **const	**local_queue_e**
ADC_SCAN_t *const	**scan_handle**
ADC_QUEUE_t *const	**queue_handle**
ADC_MEASUREMENT_ADV_SCAN_t *const	**local_scan_ha**
ADC_MEASUREMENT_ADV_QUEUE_t *const	**local_queue_h**
uint8_t	**sync_slave_g0**
uint8_t	**sync_slave_g1**
uint8_t	**sync_slave_g2**
uint8_t	**sync_slave_g3**

Field Documentation

const ADC_MEASUREMENT_ADV_CHANNEL_t** const ADC_MEAS

This holds an array of channels configured by the current instance of the **ADC_MEASUREMENT_ADV** APP

Definition at line **288** of file **ADC_MEASUREMENT_ADV.h**.

Referenced by **ADC_MEASUREMENT_ADV_Init()**.

const bool ADC_MEASUREMENT_ADV::configure_globiclass1

Copy the master channels conversion parameters to the global iclass 1. Hence the slave channels are using the same features as that of the master.

Definition at line **356** of file **ADC_MEASUREMENT_ADV.h**.

ADC_MEASUREMENT_ADV_EVENT_CONFIG_t ADC_MEASUREME

This hold the pointer to the function that does mux configuration. Which entails channel node and result node configuration

Definition at line **306** of file **ADC_MEASUREMENT_ADV.h**.

Referenced by **ADC_MEASUREMENT_ADV_Init()**.

const uint8_t ADC_MEASUREMENT_ADV::group_index

The group index number for the APP

Definition at line **345** of file **ADC_MEASUREMENT_ADV.h**.

Referenced by **ADC_MEASUREMENT_ADV_SetIclass()**, **ADC_MEASUREMENT_ADV_SetSubtractionValue()**, **ADC_MEASUREMENT_ADV_SoftwareTrigger()**, and **ADC_MEASUREMENT_ADV_StartADC()**.

ADC_MEASUREMENT_ADV_STATUS_t* ADC_MEASUREMENT_AD

This enumeration gives information about the status of the APP

Definition at line **325** of file **ADC_MEASUREMENT_ADV.h**.

Referenced by **ADC_MEASUREMENT_ADV_Init()**.

const XMC_VADC_QUEUE_ENTRY_t** const ADC_MEASUREMENT

Holds the pointer to the queue entries.

Definition at line **301** of file **ADC_MEASUREMENT_ADV.h**.

ADC_MEASUREMENT_ADV_QUEUE_t* const ADC_MEASUREMEN

Pointer to the queue handle

Definition at line **321** of file **ADC_MEASUREMENT_ADV.h**.

ADC_MEASUREMENT_ADV_SCAN_t* const ADC_MEASUREMENT

Pointer to the scan handle

Definition at line **318** of file **ADC_MEASUREMENT_ADV.h**.

const ADC_QUEUE_ENTRY_t** const ADC_MEASUREMENT_ADV:

Holds the pointer to the queue entries.

Definition at line **298** of file **ADC_MEASUREMENT_ADV.h**.

ADC_QUEUE_t* const ADC_MEASUREMENT_ADV::queue_handle

Pointer to the ADC_QUEUE APP handle

Definition at line **315** of file **ADC_MEASUREMENT_ADV.h**.

ADC_MEASUREMENT_ADV_REQUEST_SOURCE_t ADC_MEASUR

The request source used by this instance of the **ADC_MEASUREMENT_ADV** APP

Definition at line **327** of file **ADC_MEASUREMENT_ADV.h**.

Referenced by **ADC_MEASUREMENT_ADV_Init()**, **ADC_MEASUREMENT_ADV_SoftwareTrigger()**, and **ADC_MEASUREMENT_ADV_StartADC()**.

const ADC_SCAN_ENTRY_t** const ADC_MEASUREMENT_ADV::s

Holds the pointer to the scan entries.

Definition at line **295** of file **ADC_MEASUREMENT_ADV.h**.

ADC_SCAN_t* const ADC_MEASUREMENT_ADV::scan_handle

Pointer to the ADC_SCAN APP handle

Definition at line **312** of file **ADC_MEASUREMENT_ADV.h**.

const bool ADC_MEASUREMENT_ADV::start_at_initialization

This determines if the insertion of the queue or scan entries should happen after initialization of the APP

Definition at line 353 of file ADC_MEASUREMENT_ADV.h.

Referenced by ADC_MEASUREMENT_ADV_Init().

uint8_t ADC_MEASUREMENT_ADV::sync_slave_g0

If set the group-0 will be configured as the slave group.

Definition at line 335 of file ADC_MEASUREMENT_ADV.h.

uint8_t ADC_MEASUREMENT_ADV::sync_slave_g1

If set the group-1 will be configured as the slave group

Definition at line 336 of file ADC_MEASUREMENT_ADV.h.

uint8_t ADC_MEASUREMENT_ADV::sync_slave_g2

If set the group-2 will be configured as the slave group

Definition at line 337 of file ADC_MEASUREMENT_ADV.h.

uint8_t ADC_MEASUREMENT_ADV::sync_slave_g3

If set the group-3 will be configured as the slave group

Definition at line 338 of file ADC_MEASUREMENT_ADV.h.

const uint8_t ADC_MEASUREMENT_ADV::total_number_of_chann

Indicates the total number of channels configured in the current APP instance

Definition at line **350** of file **ADC_MEASUREMENT_ADV.h**.

Referenced by **ADC_MEASUREMENT_ADV_Init()**.

const uint8_t ADC_MEASUREMENT_ADV::total_number_of_entries

Indicates the total number of entries configured in the current APP instance

Definition at line **347** of file **ADC_MEASUREMENT_ADV.h**.

Referenced by **ADC_MEASUREMENT_ADV_Init()**.

The documentation for this struct was generated from the following file:

- **ADC_MEASUREMENT_ADV.h**

ADC_MEASUREMENT_ADV_CHANNEL Struct Reference

Detailed Description

Structure to configure the channels in the **ADC_MEASUREMENT_ADV** APP.

Definition at line **257** of file **ADC_MEASUREMENT_ADV.h**.

```
#include <ADC_MEASUREMENT_ADV.h>
```

Data Fields

XMC_VADC_CHANNEL_CONFIG_t *	**ch_handle**
XMC_VADC_RESULT_CONFIG_t *	**res_handle** [ADC_MEASUREMENT_ADV_
ANALOG_IO_t *	**analog_io_config**
uint8_t	**max_fifo_required**
uint8_t	**result_fifo_tail_number**
uint8_t	**group_index**
uint8_t	**ch_num**
ADC_MEASUREMENT_ADV_GAIN_t	**shs_gain_factor**

Field Documentation

ANALOG_IO_t* ADC_MEASUREMENT_ADV_CHANNEL::analog_io_

This hold the address of the ANALOG_IO configuration structure

Definition at line 265 of file ADC_MEASUREMENT_ADV.h.

Referenced by ADC_MEASUREMENT_ADV_Init().

XMC_VADC_CHANNEL_CONFIG_t* ADC_MEASUREMENT_ADV_Cl

This holds the VADC Channel LLD structures

Definition at line 259 of file ADC_MEASUREMENT_ADV.h.

Referenced by
ADC_MEASUREMENT_ADV_ConfigureChannelClass(),
ADC_MEASUREMENT_ADV_GetDetailedResult(),
ADC_MEASUREMENT_ADV_GetFastCompareResult(),
ADC_MEASUREMENT_ADV_GetResult(),
ADC_MEASUREMENT_ADV_Init(),
ADC_MEASUREMENT_ADV_SetBoundaryLower(),
ADC_MEASUREMENT_ADV_SetBoundaryUpper(),
ADC_MEASUREMENT_ADV_SetChannelGain(), and
ADC_MEASUREMENT_ADV_SetFastCompareValue().

uint8_t ADC_MEASUREMENT_ADV_CHANNEL::ch_num

This Holds the Channel Number

Definition at line 275 of file ADC_MEASUREMENT_ADV.h.

Referenced by ADC_MEASUREMENT_ADV_GetAliasValue(),

ADC_MEASUREMENT_ADV_Init(),
ADC_MEASUREMENT_ADV_SelectBoundary(),
ADC_MEASUREMENT_ADV_SetAlternateReference(), and
ADC_MEASUREMENT_ADV_SetChannelGain().

uint8_t ADC_MEASUREMENT_ADV_CHANNEL::group_index

This holds the group index

Definition at line 273 of file ADC_MEASUREMENT_ADV.h.

Referenced by
ADC_MEASUREMENT_ADV_ConfigureChannelClass(),
ADC_MEASUREMENT_ADV_GetAliasValue(),
ADC_MEASUREMENT_ADV_GetDetailedResult(),
ADC_MEASUREMENT_ADV_GetFastCompareResult(),
ADC_MEASUREMENT_ADV_GetFifoDetailedResult(),
ADC_MEASUREMENT_ADV_GetFifoResult(),
ADC_MEASUREMENT_ADV_GetResult(),
ADC_MEASUREMENT_ADV_Init(),
ADC_MEASUREMENT_ADV_SelectBoundary(),
ADC_MEASUREMENT_ADV_SetAlternateReference(),
ADC_MEASUREMENT_ADV_SetChannelGain(), and
ADC_MEASUREMENT_ADV_SetFastCompareValue().

uint8_t ADC_MEASUREMENT_ADV_CHANNEL::max_fifo_required

The required number of FIFO elements

Definition at line 269 of file ADC_MEASUREMENT_ADV.h.

XMC_VADC_RESULT_CONFIG_t* ADC_MEASUREMENT_ADV_CHA

This hold the VADC LLD Result configuration structures

Definition at line 261 of file ADC_MEASUREMENT_ADV.h.

uint8_t ADC_MEASUREMENT_ADV_CHANNEL::result_fifo_tail_nu

The tail result register number if FIFO is selected.

Definition at line 271 of file ADC_MEASUREMENT_ADV.h.

Referenced by ADC_MEASUREMENT_ADV_GetFifoDetailedResult(), and ADC_MEASUREMENT_ADV_GetFifoResult().

ADC_MEASUREMENT_ADV_GAIN_t ADC_MEASUREMENT_ADV_C

The required gain factor for the channel.

Definition at line 278 of file ADC_MEASUREMENT_ADV.h.

Referenced by ADC_MEASUREMENT_ADV_Init().

The documentation for this struct was generated from the following file:

- ADC_MEASUREMENT_ADV.h

ADC_MEASUREMENT_ADV_NVIC_CONFIG Struct Reference

Detailed Description

NVIC Configuration structure for request source interrupt.

Definition at line **195** of file **ADC_MEASUREMENT_ADV.h**.

```
#include <ADC_MEASUREMENT_ADV.h>
```

Data Fields

uint32_t	**node_id**
uint32_t	**priority**
uint32_t	**sub_priority**
bool	**interrupt_enable**
uint8_t	**irqctrl**

Field Documentation

bool ADC_MEASUREMENT_ADV_NVIC_CONFIG::interrupt_enable

This flag indicates if a Interrupt has been requested.

Definition at line 203 of file ADC_MEASUREMENT_ADV.h.

uint8_t ADC_MEASUREMENT_ADV_NVIC_CONFIG::irqctrl

This indicates the service request source selected for the consumed NVIC node.

Definition at line 205 of file ADC_MEASUREMENT_ADV.h.

uint32_t ADC_MEASUREMENT_ADV_NVIC_CONFIG::node_id

This indicates the NVIC Node number.

Definition at line 197 of file ADC_MEASUREMENT_ADV.h.

uint32_t ADC_MEASUREMENT_ADV_NVIC_CONFIG::priority

This indicates the NVIC priority.

Definition at line 199 of file ADC_MEASUREMENT_ADV.h.

uint32_t ADC_MEASUREMENT_ADV_NVIC_CONFIG::sub_priority

This indicates the NVIC sub priority in XMC4x Devices.

Definition at line 201 of file ADC_MEASUREMENT_ADV.h.

The documentation for this struct was generated from the following file:

- **ADC_MEASUREMENT_ADV.h**

ADC_MEASUREMENT_ADV_QUEUE Struct Reference

Detailed Description

Configuration Data structure of queue request source.

Definition at line **236** of file **ADC_MEASUREMENT_ADV.h**.

```
#include <ADC_MEASUREMENT_ADV.h>
```

Data Fields

const **ADC_MEASUREMENT_ADV_NVIC_CONFIG_t**	**rs_intr_handle**
const XMC_VADC_GROUP_CLASS_t	**iclass_config_handl**
const XMC_VADC_QUEUE_CONFIG_t *const	**queue_config_hand**
const XMC_VADC_GATEMODE_t	**gating_mode**
const XMC_VADC_SR_t	**srv_req_node**
const uint8_t	**iclass_num**

Field Documentation

const XMC_VADC_GATEMODE_t ADC_MEASUREMENT_ADV_QUE

Gating mode configuration needed for Scan request source

Definition at line **244** of file **ADC_MEASUREMENT_ADV.h**.

const XMC_VADC_GROUP_CLASS_t ADC_MEASUREMENT_ADV_

Holds the ICLASS Configurations

Definition at line **240** of file **ADC_MEASUREMENT_ADV.h**.

const uint8_t ADC_MEASUREMENT_ADV_QUEUE::iclass_num

Holds the ICLASS ID either ICLASS-0 or ICLASS-1

Definition at line **248** of file **ADC_MEASUREMENT_ADV.h**.

const XMC_VADC_QUEUE_CONFIG_t* const ADC_MEASUREMENT

Holds the LLD QUEUE Structure

Definition at line **242** of file **ADC_MEASUREMENT_ADV.h**.

const ADC_MEASUREMENT_ADV_NVIC_CONFIG_t ADC_MEASUR

Holds the ISR Handle

Definition at line **238** of file **ADC_MEASUREMENT_ADV.h**.

const XMC_VADC_SR_t ADC_MEASUREMENT_ADV_QUEUE::srv_

Source event interrupt node pointer

Definition at line **246** of file **ADC_MEASUREMENT_ADV.h**.

The documentation for this struct was generated from the following file:

- **ADC_MEASUREMENT_ADV.h**

ADC_MEASUREMENT_ADV_SCAN Struct Reference

Detailed Description

Configuration Data structure of scan request source.

Definition at line **213** of file **ADC_MEASUREMENT_ADV.h**.

```
#include <ADC_MEASUREMENT_ADV.h>
```

Data Fields

const **ADC_MEASUREMENT_ADV_NVIC_CONFIG_t**	**rs_intr_handle**
const XMC_VADC_GROUP_CLASS_t	**iclass_config_handl**
const XMC_VADC_SCAN_CONFIG_t *const	**scan_config_handle**
const XMC_VADC_GATEMODE_t	**gating_mode**
const XMC_VADC_SR_t	**srv_req_node**
const uint32_t	**insert_mask**
const uint8_t	**iclass_num**

Field Documentation

const XMC_VADC_GATEMODE_t ADC_MEASUREMENT_ADV_SCA

Gating mode configuration needed for Scan request source

Definition at line **221** of file **ADC_MEASUREMENT_ADV.h**.

const XMC_VADC_GROUP_CLASS_t ADC_MEASUREMENT_ADV_

Holds the ICLASS Configurations

Definition at line **217** of file **ADC_MEASUREMENT_ADV.h**.

const uint8_t ADC_MEASUREMENT_ADV_SCAN::iclass_num

Holds the ICLASS ID either ICLASS-0 or ICLASS-1

Definition at line **227** of file **ADC_MEASUREMENT_ADV.h**.

const uint32_t ADC_MEASUREMENT_ADV_SCAN::insert_mask

Insert Mask for the scan request source

Definition at line **225** of file **ADC_MEASUREMENT_ADV.h**.

const ADC_MEASUREMENT_ADV_NVIC_CONFIG_t ADC_MEASUR

Holds the ISR Handle

Definition at line **215** of file **ADC_MEASUREMENT_ADV.h**.

const XMC_VADC_SCAN_CONFIG_t* const ADC_MEASUREMENT_

Holds the LLD SCAN Structure

Definition at line **219** of file **ADC_MEASUREMENT_ADV.h**.

const XMC_VADC_SR_t ADC_MEASUREMENT_ADV_SCAN::srv_re

Source event interrupt node pointer

Definition at line **223** of file **ADC_MEASUREMENT_ADV.h**.

The documentation for this struct was generated from the following file:

- **ADC_MEASUREMENT_ADV.h**

Data Structure Index

ADC_MEASUREMENT_ADV

Here is a list of all documented struct and union fields with links to the struct/union documentation for each field:

- a -

- analog_io_config : **ADC_MEASUREMENT_ADV_CHANNEL**

- c -

- ch_handle : **ADC_MEASUREMENT_ADV_CHANNEL**
- ch_num : **ADC_MEASUREMENT_ADV_CHANNEL**
- channel_array : **ADC_MEASUREMENT_ADV**
- configure_globiclass1 : **ADC_MEASUREMENT_ADV**

- e -

- event_config : **ADC_MEASUREMENT_ADV**

- g -

- gating_mode : **ADC_MEASUREMENT_ADV_SCAN** , **ADC_MEASUREMENT_ADV_QUEUE**
- group_index : **ADC_MEASUREMENT_ADV_CHANNEL** , **ADC_MEASUREMENT_ADV**

- i -

- iclass_config_handle : **ADC_MEASUREMENT_ADV_SCAN** , **ADC_MEASUREMENT_ADV_QUEUE**
- iclass_num : **ADC_MEASUREMENT_ADV_QUEUE** ,

- scan_config_handle : **ADC_MEASUREMENT_ADV_SCAN**
- scan_entries : **ADC_MEASUREMENT_ADV**
- scan_handle : **ADC_MEASUREMENT_ADV**
- shs_gain_factor : **ADC_MEASUREMENT_ADV_CHANNEL**
- srv_req_node : **ADC_MEASUREMENT_ADV_SCAN** , **ADC_MEASUREMENT_ADV_QUEUE**
- start_at_initialization : **ADC_MEASUREMENT_ADV**
- sub_priority : **ADC_MEASUREMENT_ADV_NVIC_CONFIG**
- sync_slave_g0 : **ADC_MEASUREMENT_ADV**
- sync_slave_g1 : **ADC_MEASUREMENT_ADV**
- sync_slave_g2 : **ADC_MEASUREMENT_ADV**
- sync_slave_g3 : **ADC_MEASUREMENT_ADV**

- t -

- total_number_of_channels : **ADC_MEASUREMENT_ADV**
- total_number_of_entries : **ADC_MEASUREMENT_ADV**

ADC_MEASUREMENT_ADV

- a -

- analog_io_config : **ADC_MEASUREMENT_ADV_CHANNEL**

- c -

- ch_handle : **ADC_MEASUREMENT_ADV_CHANNEL**
- ch_num : **ADC_MEASUREMENT_ADV_CHANNEL**
- channel_array : **ADC_MEASUREMENT_ADV**
- configure_globiclass1 : **ADC_MEASUREMENT_ADV**

- e -

- event_config : **ADC_MEASUREMENT_ADV**

- g -

- gating_mode : **ADC_MEASUREMENT_ADV_SCAN** , **ADC_MEASUREMENT_ADV_QUEUE**
- group_index : **ADC_MEASUREMENT_ADV_CHANNEL** , **ADC_MEASUREMENT_ADV**

- i -

- iclass_config_handle : **ADC_MEASUREMENT_ADV_SCAN** , **ADC_MEASUREMENT_ADV_QUEUE**
- iclass_num : **ADC_MEASUREMENT_ADV_QUEUE** , **ADC_MEASUREMENT_ADV_SCAN**

- scan_config_handle : **ADC_MEASUREMENT_ADV_SCAN**
- scan_entries : **ADC_MEASUREMENT_ADV**
- scan_handle : **ADC_MEASUREMENT_ADV**
- shs_gain_factor : **ADC_MEASUREMENT_ADV_CHANNEL**
- srv_req_node : **ADC_MEASUREMENT_ADV_SCAN** , **ADC_MEASUREMENT_ADV_QUEUE**
- start_at_initialization : **ADC_MEASUREMENT_ADV**
- sub_priority : **ADC_MEASUREMENT_ADV_NVIC_CONFIG**
- sync_slave_g0 : **ADC_MEASUREMENT_ADV**
- sync_slave_g1 : **ADC_MEASUREMENT_ADV**
- sync_slave_g2 : **ADC_MEASUREMENT_ADV**
- sync_slave_g3 : **ADC_MEASUREMENT_ADV**

- t -

- total_number_of_channels : **ADC_MEASUREMENT_ADV**
- total_number_of_entries : **ADC_MEASUREMENT_ADV**

ADC_MEASUREMENT_ADV

Home

File List

File List

Here is a list of all documented files with brief descriptions:

ADC_MEASUREMENT_ADV.c [code]	
ADC_MEASUREMENT_ADV.h [code]	

ADC_MEASUREMENT_ADV

ADC_MEASUREMENT_ADV.h

```
/*CODE_BLOCK_BEGIN*/
#ifndef ADC_MEASUREMENT_ADV_H
#define ADC_MEASUREMENT_ADV_H


/*******************************************************************************************************************
 * HEADER FILES
 ******************************************************************************************************************/

#include "GLOBAL_ADC/global_adc.h"
#include "adc_measurement_adv_conf.h"

 /*******************************************************************************************************************
 * MACROS
 ******************************************************************************************************************/
#if (!((XMC_LIB_MAJOR_VERSION == 2U) && \
       (XMC_LIB_MINOR_VERSION >= 1U) && \
       (XMC_LIB_PATCH_VERSION >= 8U)))
#error "ADC_MEASUREMENT_ADV requires XMC Per
```

```
ipheral Library v2.1.8 or higher"
#endif
/**************************************************************************************************************************
 * ENUMS
 **************************************************************************************************************************/
typedef enum ADC_MEASUREMENT_ADV_STATUS
{
  ADC_MEASUREMENT_ADV_STATUS_SUCCESS = 0,
  ADC_MEASUREMENT_ADV_STATUS_FAILURE,
  ADC_MEASUREMENT_ADV_STATUS_UNINITIALIZED
} ADC_MEASUREMENT_ADV_STATUS_t;


typedef enum ADC_MEASUREMENT_ADV_REQUEST_SOURCE
{
  ADC_MEASUREMENT_ADV_REQUEST_SOURCE_SCAN = 0,
  ADC_MEASUREMENT_ADV_REQUEST_SOURCE_LOCAL_SCAN,
  ADC_MEASUREMENT_ADV_REQUEST_SOURCE_QUEUE,
  ADC_MEASUREMENT_ADV_REQUEST_SOURCE_LOCAL_QUEUE,
} ADC_MEASUREMENT_ADV_REQUEST_SOURCE_t;

typedef enum ADC_MEASUREMENT_ADV_GAIN
{
  ADC_MEASUREMENT_ADV_GAIN_1 = 0U,
  ADC_MEASUREMENT_ADV_GAIN_3 = 1U,
  ADC_MEASUREMENT_ADV_GAIN_6 = 2U,
  ADC_MEASUREMENT_ADV_GAIN_12 = 3U
} ADC_MEASUREMENT_ADV_GAIN_t;
```

```
typedef enum ADC_MEASUREMENT_ADV_SUBTRATION
{
  ADC_MEASUREMENT_ADV_SUBTRATION_12BIT_LEFT_ALIGN  = 0U,
  ADC_MEASUREMENT_ADV_SUBTRATION_12BIT_RIGHT_ALIGN = 0U,
  ADC_MEASUREMENT_ADV_SUBTRATION_10BIT_LEFT_ALIGN  = 2U,
  ADC_MEASUREMENT_ADV_SUBTRATION_10BIT_RIGHT_ALIGN = 0U,
  ADC_MEASUREMENT_ADV_SUBTRATION_8BIT_LEFT_ALIGN   = 4U,
  ADC_MEASUREMENT_ADV_SUBTRATION_8BIT_RIGHT_ALIGN  = 0U
} ADC_MEASUREMENT_ADV_SUBTRATION_t;

typedef enum ADC_MEASUREMENT_ADV_FAST_COMPARE
{
  ADC_MEASUREMENT_ADV_FAST_COMPARE_LOW     = 0U,
  ADC_MEASUREMENT_ADV_FAST_COMPARE_HIGH    = 1U,
  ADC_MEASUREMENT_ADV_FAST_COMPARE_INVALID = 2U
} ADC_MEASUREMENT_ADV_FAST_COMPARE_t;

typedef enum ADC_MEASUREMENT_ADV_SYNC_SEQ
{
  ADC_MEASUREMENT_ADV_SYNC_SEQ_POWER_DOWN = 0U,
  ADC_MEASUREMENT_ADV_SYNC_SEQ_STSEL_CONFIG,
  ADC_MEASUREMENT_ADV_SYNC_SEQ_EVAL_CONFIG,
} ADC_MEASUREMENT_ADV_SYNC_SEQ_t;
```

```c

/**********************************************************************************************************************
* DATA STRUCTURES
**********************************************************************************************************************/
/*Anonymous structure/union guard start*/
#if defined(__CC_ARM)
  #pragma push
  #pragma anon_unions
#elif defined(__TASKING__)
  #pragma warning 586
#endif

typedef void (*ADC_MEASUREMENT_ADV_EVENT_CONFIG_t)(void);
typedef struct ADC_MEASUREMENT_ADV_NVIC_CONFIG
{
  uint32_t node_id;
  uint32_t priority;
#if(UC_FAMILY == XMC4)
  uint32_t sub_priority;
#endif
  bool interrupt_enable;
#ifdef ADC_MEASUREMENT_ADV_NON_DEFAULT_IRQ_SOURCE_SELECTED
  uint8_t irqctrl;
#endif
} ADC_MEASUREMENT_ADV_NVIC_CONFIG_t;

#ifdef ADC_MEASUREMENT_ADV_LOCAL_SCAN_USED

typedef struct ADC_MEASUREMENT_ADV_SCAN
{
```

```
  const ADC_MEASUREMENT_ADV_NVIC_CONFIG_t rs_intr_handle;
  const XMC_VADC_GROUP_CLASS_t iclass_config_handle;
  const XMC_VADC_SCAN_CONFIG_t *const scan_config_handle;
  const XMC_VADC_GATEMODE_t gating_mode;

  const XMC_VADC_SR_t srv_req_node;

  const uint32_t  insert_mask;

  const uint8_t iclass_num;

} ADC_MEASUREMENT_ADV_SCAN_t;
#endif

#ifdef ADC_MEASUREMENT_ADV_LOCAL_QUEUE_USED

typedef struct ADC_MEASUREMENT_ADV_QUEUE
{
  const ADC_MEASUREMENT_ADV_NVIC_CONFIG_t rs_intr_handle;
  const XMC_VADC_GROUP_CLASS_t iclass_config_handle;
  const XMC_VADC_QUEUE_CONFIG_t *const queue_config_handle;
  const XMC_VADC_GATEMODE_t gating_mode;

  const XMC_VADC_SR_t srv_req_node;

  const uint8_t iclass_num;

} ADC_MEASUREMENT_ADV_QUEUE_t;
#endif


```

```
typedef struct ADC_MEASUREMENT_ADV_CHANNEL
{
  XMC_VADC_CHANNEL_CONFIG_t *ch_handle;
  XMC_VADC_RESULT_CONFIG_t *res_handle[ADC_MEASUREMENT_ADV_RESULT_REG];
#ifdef ADC_MEASUREMENT_ADV_ANALOG_IO_USED
  ANALOG_IO_t   *analog_io_config;
#endif

#ifdef ADC_MEASUREMENT_ADV_FIFO_USED
  uint8_t max_fifo_required;
  uint8_t result_fifo_tail_number;
#endif
  uint8_t group_index;
  uint8_t ch_num;
#if(UC_FAMILY == XMC1)
  ADC_MEASUREMENT_ADV_GAIN_t shs_gain_factor;
#endif

} ADC_MEASUREMENT_ADV_CHANNEL_t;

typedef struct ADC_MEASUREMENT_ADV
{
  const ADC_MEASUREMENT_ADV_CHANNEL_t **const channel_array;
#if defined(ADC_MEASUREMENT_ADV_ADC_SCAN_USED) || defined(ADC_MEASUREMENT_ADV_ADC_QUEUE_USED) || \
    defined(ADC_MEASUREMENT_ADV_LOCAL_QUEUE_USED)
  union
  {
#ifdef ADC_MEASUREMENT_ADV_ADC_SCAN_USED
  const ADC_SCAN_ENTRY_t **const scan_entries;
#endif
```

```
#ifdef ADC_MEASUREMENT_ADV_ADC_QUEUE_USED
  const ADC_QUEUE_ENTRY_t **const queue_entries;
#endif
#ifdef ADC_MEASUREMENT_ADV_LOCAL_QUEUE_USED
  const XMC_VADC_QUEUE_ENTRY_t **const local_queue_entries;
#endif
  };
#endif

  ADC_MEASUREMENT_ADV_EVENT_CONFIG_t event_config;
  union
  {
#ifdef ADC_MEASUREMENT_ADV_ADC_SCAN_USED
    ADC_SCAN_t *const scan_handle;
#endif
#ifdef ADC_MEASUREMENT_ADV_ADC_QUEUE_USED
    ADC_QUEUE_t *const queue_handle;
#endif
#ifdef ADC_MEASUREMENT_ADV_LOCAL_SCAN_USED
    ADC_MEASUREMENT_ADV_SCAN_t *const local_scan_handle;
#endif
#ifdef ADC_MEASUREMENT_ADV_LOCAL_QUEUE_USED
    ADC_MEASUREMENT_ADV_QUEUE_t *const local_queue_handle;
#endif
  };

  ADC_MEASUREMENT_ADV_STATUS_t *init_state;

  ADC_MEASUREMENT_ADV_REQUEST_SOURCE_t req_src;
#ifdef ADC_MEASUREMENT_ADV_SYNC_USED
  union
```

```
  {
    struct
    {
      uint8_t sync_slave_g0 :1;
      uint8_t sync_slave_g1 :1;
      uint8_t sync_slave_g2 :1;
      uint8_t sync_slave_g3 :1;
      uint8_t               :4;
    };
    uint8_t sync_slaves;
  };

#endif
  const uint8_t group_index;
  const uint8_t total_number_of_entries;
  const uint8_t total_number_of_channels;
  const bool start_at_initialization;
#ifdef ADC_MEASUREMENT_ADV_SYNC_USED
  const bool configure_globiclass1;
#endif
} ADC_MEASUREMENT_ADV_t;

/*Anonymous structure/union guard end*/
#if defined(__CC_ARM)
  #pragma pop
#elif defined(__TASKING__)
  #pragma warning restore
#endif

#ifdef __cplusplus
extern "C" {
#endif

/*******************************************
**************************************************
**************************
 * API Prototypes
```

```
 **********************************************************************************************************************/
DAVE_APP_VERSION_t ADC_MEASUREMENT_ADV_GetAppVersion(void);

void ADC_MEASUREMENT_ADV_StartADC(const ADC_MEASUREMENT_ADV_t *const handle_ptr);

void ADC_MEASUREMENT_ADV_SoftwareTrigger(const ADC_MEASUREMENT_ADV_t *const handle_ptr);

ADC_MEASUREMENT_ADV_STATUS_t ADC_MEASUREMENT_ADV_Init(const ADC_MEASUREMENT_ADV_t *const handle_ptr);

__STATIC_INLINE uint16_t ADC_MEASUREMENT_ADV_GetResult(const ADC_MEASUREMENT_ADV_CHANNEL_t *const handle_ptr)
{
  uint16_t result;
  extern XMC_VADC_GROUP_t *const group_ptrs[XMC_VADC_MAXIMUM_NUM_GROUPS];
  XMC_ASSERT("ADC_MEASUREMENT_ADV_GetResult:Invalid handle_ptr", (handle_ptr != NULL))

  result = XMC_VADC_GROUP_GetResult(group_ptrs[handle_ptr->group_index],
                                    (uint32_t) handle_ptr->ch_handle->result_reg_number);
  return(result);
}

__STATIC_INLINE XMC_VADC_DETAILED_RESULT_t ADC_MEASUREMENT_ADV_GetDetailedResult(const
                                                      ADC_MEASUREMENT_ADV_CHA
```

```
NNEL_t *const handle_ptr)
{
  XMC_VADC_DETAILED_RESULT_t result_register;
  extern XMC_VADC_GROUP_t *const group_ptrs[XMC_VADC_MAXIMUM_NUM_GROUPS];
  XMC_ASSERT("ADC_MEASUREMENT_ADV_GetDetailedResult:Invalid handle_ptr", (handle_ptr != NULL))

  result_register.res = XMC_VADC_GROUP_GetDetailedResult(group_ptrs[handle_ptr->group_index],
                                    (uint32_t) handle_ptr->ch_handle->result_reg_number);
  return(result_register);
}
#ifdef ADC_MEASUREMENT_ADV_FIFO_USED

__STATIC_INLINE uint16_t ADC_MEASUREMENT_ADV_GetFifoResult(const ADC_MEASUREMENT_ADV_CHANNEL_t *const handle_ptr)
{
  uint16_t result;
  extern XMC_VADC_GROUP_t *const group_ptrs[XMC_VADC_MAXIMUM_NUM_GROUPS];
  XMC_ASSERT("ADC_MEASUREMENT_ADV_GetFifoResult:Invalid handle_ptr", (handle_ptr != NULL))

  result = XMC_VADC_GROUP_GetResult(group_ptrs[handle_ptr->group_index], handle_ptr->result_fifo_tail_number);
  return(result);
}
__STATIC_INLINE XMC_VADC_DETAILED_RESULT_t ADC_MEASUREMENT_ADV_GetFifoDetailedResult(const
                                                  ADC_MEASUREMENT_ADV_CHA
```

```
NNEL_t *const handle_ptr)
{
  XMC_VADC_DETAILED_RESULT_t result_register;
  extern XMC_VADC_GROUP_t *const group_ptrs[XMC_VADC_MAXIMUM_NUM_GROUPS];
  XMC_ASSERT("ADC_MEASUREMENT_ADV_GetFifoDetailedResult:Invalid handle_ptr", (handle_ptr != NULL))

  result_register.res = XMC_VADC_GROUP_GetDetailedResult(group_ptrs[handle_ptr->group_index],
                                                         handle_ptr->result_fifo_tail_number);
  return(result_register);
}

#endif

__STATIC_INLINE ADC_MEASUREMENT_ADV_FAST_COMPARE_t ADC_MEASUREMENT_ADV_GetFastCompareResult(const
                                                           ADC_MEASUREMENT_ADV_CHANNEL_t *const handle_ptr)
{
  ADC_MEASUREMENT_ADV_FAST_COMPARE_t fast_compare_result;
  extern XMC_VADC_GROUP_t *const group_ptrs[XMC_VADC_MAXIMUM_NUM_GROUPS];
  XMC_ASSERT("ADC_MEASUREMENT_ADV_GetFastCompareResult:Invalid handle_ptr", (handle_ptr != NULL))

  fast_compare_result = (ADC_MEASUREMENT_ADV_FAST_COMPARE_t)XMC_VADC_GROUP_GetFastCompareResult(
```

```
                                                          group_ptrs[handle_ptr->group_index],(uint32_t) handle_ptr->ch_handle->result_reg_number);

  return(fast_compare_result);
}

ADC_MEASUREMENT_ADV_STATUS_t ADC_MEASUREMENT_ADV_SetFastCompareValue(const ADC_MEASUREMENT_ADV_CHANNEL_t *const handle_ptr,
                                                                     uint16_t compare_value);

void ADC_MEASUREMENT_ADV_SetSubtractionValue(const ADC_MEASUREMENT_ADV_t *const handle_ptr,
  ADC_MEASUREMENT_ADV_SUBTRATION_t subtraction_alignment,
  uint16_t subtraction_value);

void ADC_MEASUREMENT_ADV_ConfigureChannelClass(const ADC_MEASUREMENT_ADV_CHANNEL_t *const handle_ptr,
   const XMC_VADC_GROUP_CLASS_t *config);

void ADC_MEASUREMENT_ADV_SetAlternateReference(const ADC_MEASUREMENT_ADV_CHANNEL_t *const handle_ptr,
    const XMC_VADC_CHANNEL_REF_t reference_select);

#if (XMC_VADC_SHS_AVAILABLE == 1U)

void ADC_MEASUREMENT_ADV_SetChannelGain(const
```

```
 ADC_MEASUREMENT_ADV_CHANNEL_t *const handle_ptr,
                                   const ADC_MEASUREMENT_ADV_GAIN_t gain_factor);
#endif


void ADC_MEASUREMENT_ADV_SelectBoundary(const ADC_MEASUREMENT_ADV_CHANNEL_t *const handle_ptr,
                                        XMC_VADC_BOUNDARY_SELECT_t boundary,
                                        XMC_VADC_CHANNEL_BOUNDARY_t boundary_selection);

void ADC_MEASUREMENT_ADV_SetBoundaryUpper(const ADC_MEASUREMENT_ADV_CHANNEL_t *const handle_ptr,
                                          uint32_t boundary_value);

void ADC_MEASUREMENT_ADV_SetBoundaryLower(const ADC_MEASUREMENT_ADV_CHANNEL_t *const handle_ptr,
                                          uint32_t boundary_value);


XMC_VADC_CHANNEL_ALIAS_t ADC_MEASUREMENT_ADV_GetAliasValue(const ADC_MEASUREMENT_ADV_CHANNEL_t *const handle_ptr);

#ifdef ADC_MEASUREMENT_ADV_SYNC_USED

void ADC_MEASUREMENT_ADV_SetIclass(const ADC_MEASUREMENT_ADV_t *const handle_ptr);
#endif

#include "adc_measurement_adv_extern.h"
```

```
#ifdef __cplusplus
}
#endif

#endif /* _ADC_MEASUREMENT_ADV_H_*/
```

ADC_MEASUREMENT_ADV

Home

File List

ADC_MEASUREMENT_ADV.c

```c

/************************************************************************************************************************
 * HEADER FILES
 ************************************************************************************************************************/
#include "adc_measurement_adv.h"

/************************************************************************************************************************
 * MACROS
 ************************************************************************************************************************/
/* Pointer to the VADC GLOBAL*/
#define ADC_MEASUREMENT_ADV_GLOBAL_PTR ((XMC_VADC_GLOBAL_t *) (void *) VADC)

/* Max value possible with 10 bit resolution is 1023*/
#define ADC_MEASUREMENT_ADV_10_BIT_MAX_VALUE ((uint32_t)1023)

#if (XMC_VADC_SHS_AVAILABLE == 1U)
  /* Pointer to the SHS unit */
```

```
  #define ADC_MEASUREMENT_ADV_SHS_PTR ((XMC_VADC_GLOBAL_SHS_t *) (void *) SHS0)
#endif

#define ADC_MEASUREMENT_ADV_RESERVED_REGISTERS ((uint32_t)2)

#define ADC_MEASUREMENT_ADV_HEAD_RESULT_REG_CONFIG ((uint32_t)0)

#define ADC_MEASUREMENT_ADV_TAIL_RESULT_REG_CONFIG ((uint32_t)1)

/* Configure the slave input class as global input class 1*/
#define ADC_MEASUREMENT_ADV_GLOBICLASS1 ((uint32_t)1)


/* Since the SCU is different for various devices a macro is defined here to enable check of clock-ungating*/
#if UC_FAMILY == XMC1
  #define ADC_MEASUREMENT_ADV_CHECK_CLOCK_GATING ((uint32_t)1)
#endif

/***********************************************************************************************************************
 * LOCAL DATA
 **********************************************************************************************************************/
 /* Array of Group pointers*/
 XMC_VADC_GROUP_t *const group_ptrs[XMC_VADC_MAXIMUM_NUM_GROUPS] =
```

```
 {
    (VADC_G_TypeDef*)(void*) VADC_G0,
    (VADC_G_TypeDef*)(void*) VADC_G1
 #if (XMC_VADC_MAXIMUM_NUM_GROUPS > 2U)
   ,(VADC_G_TypeDef*)(void*) VADC_G2,
    (VADC_G_TypeDef*)(void*) VADC_G3
 #endif
 };

#ifdef ADC_MEASUREMENT_ADV_FIFO_USED

static const XMC_VADC_RESULT_CONFIG_t ADC_MEASUREMENT_ADV_fifo_intermediate_stage =
{
    .data_reduction_control = 0,
    .post_processing_mode   = 0,
    .wait_for_read_mode     = 0,
    .part_of_fifo           = (bool)true,
    .event_gen_enable       = 0
};
#endif

/*Anonymous structure/union guard start*/
#if defined(__CC_ARM)
  #pragma push
  #pragma anon_unions
#elif defined(__TASKING__)
  #pragma warning 586
#endif

/* Private structure to determine the ALIAS*/
typedef struct ADC_MEASUREMENT_ADV_ALIAS
{
  union
  {
    struct
```

```
    {
      uint32_t alias0 : 5; /* ALIAS for Channel 0*/
      uint32_t        : 3;
      uint32_t alias1 : 5; /* ALIAS for channel 1*/
      uint32_t        : 19;
    };
    uint32_t alias;
  };
}ADC_MEASUREMENT_ADV_ALIAS_t;

/*Anonymous structure/union guard end*/
#if defined(__CC_ARM)
  #pragma pop
#elif defined(__TASKING__)
  #pragma warning restore
#endif
/***********************************************************************************************************************
 * LOCAL ROUTINES
 **********************************************************************************************************************/
#if defined(ADC_MEASUREMENT_ADV_ADC_QUEUE_USED) || defined (ADC_MEASUREMENT_ADV_ADC_SCAN_USED)
/* Local function to insert an entry into the H/W*/
__STATIC_INLINE void ADC_MEASUREMENT_ADV_lInsertEntry(const ADC_MEASUREMENT_ADV_t *const handle_ptr, uint8_t ch_num)
{
#if defined( ADC_MEASUREMENT_ADV_SCAN_USED) && defined(ADC_MEASUREMENT_ADV_ADC_SCAN_USED)
  #if defined (ADC_MEASUREMENT_ADV_QUEUE_USED) && defined(ADC_MEASUREMENT_ADV_ADC_QUEUE_USED)
```

```
    if ( ADC_MEASUREMENT_ADV_REQUEST_SOURCE_SCAN == handle_ptr->req_src)
  #endif
    {
      ADC_SCAN_InsertScanEntry(handle_ptr->scan_handle, handle_ptr->scan_entries[ch_num]);
    }
#endif
#if defined(ADC_MEASUREMENT_ADV_QUEUE_USED) && defined(ADC_MEASUREMENT_ADV_ADC_QUEUE_USED)
  #if defined(ADC_MEASUREMENT_ADV_SCAN_USED) && defined(ADC_MEASUREMENT_ADV_ADC_SCAN_USED)
    else
  #endif
    {
      ADC_QUEUE_InsertQueueEntry(handle_ptr->queue_handle, handle_ptr->queue_entries[ch_num]);
    }
#endif
}
#endif

/*~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~*/
XMC_VADC_CHANNEL_CONV_t  ADC_MEASUREMENT_ADV_lGetIclass(const ADC_MEASUREMENT_ADV_t *const handle_ptr)
{
  XMC_VADC_CHANNEL_CONV_t req_iclass;

#ifdef ADC_MEASUREMENT_ADV_SCAN_USED
  #ifdef ADC_MEASUREMENT_ADV_QUEUE_USED
    if ( ADC_MEASUREMENT_ADV_REQUEST_SOURCE_LOCAL_SCAN >= handle_ptr->req_src)
  #endif
    {
```

```
#ifdef ADC_MEASUREMENT_ADV_LOCAL_SCAN_USED
  #ifdef ADC_MEASUREMENT_ADV_ADC_SCAN_USED
      if ( ADC_MEASUREMENT_ADV_REQUEST_SOURCE_SCAN != handle_ptr->req_src)
  #endif
      {
        req_iclass = (XMC_VADC_CHANNEL_CONV_t)handle_ptr->local_scan_handle->iclass_num;
      }
#endif

#ifdef ADC_MEASUREMENT_ADV_ADC_SCAN_USED
  #ifdef ADC_MEASUREMENT_ADV_LOCAL_SCAN_USED
      else
  #endif
      {
        /* Call the function to initialise Clock and ADC global functional units*/
        req_iclass = (XMC_VADC_CHANNEL_CONV_t)handle_ptr->scan_handle->iclass_num;
      }
#endif
    }
#endif

#ifdef ADC_MEASUREMENT_ADV_QUEUE_USED
  #ifdef ADC_MEASUREMENT_ADV_SCAN_USED
    else
  #endif
    {
#ifdef ADC_MEASUREMENT_ADV_LOCAL_QUEUE_USED
  #ifdef ADC_MEASUREMENT_ADV_ADC_QUEUE_USED
      if ( ADC_MEASUREMENT_ADV_REQUEST_SOURCE_QUEUE != handle_ptr->req_src)
  #endif
      {
        req_iclass = (XMC_VADC_CHANNEL_CONV_
```

```
t)handle_ptr->local_queue_handle->iclass_num;
      }
#endif

#ifdef ADC_MEASUREMENT_ADV_ADC_QUEUE_USED
  #ifdef ADC_MEASUREMENT_ADV_LOCAL_QUEUE_USED
      else
  #endif
      {
        req_iclass = (XMC_VADC_CHANNEL_CONV_t)handle_ptr->queue_handle->iclass_num;
      }
#endif
    }
#endif
    return (req_iclass);
}

/*~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~*/
#ifdef ADC_MEASUREMENT_ADV_SYNC_USED

/* Helper function to configure the eval bits in the slave*/
void ADC_MEASUREMENT_ADV_lSyncEvalConfig(uint32_t master_group, uint32_t slave_selected,
                                          uint32_t sync_group)
{
  int8_t group_index;
  sync_group |= (1U << master_group);
  sync_group &= ~(1U << slave_selected);
  for( group_index = XMC_VADC_MAXIMUM_NUM_GROUPS - (int32_t)1; group_index >= (int32_t)0  ; group_index--)
```

```
  {
    if ( (bool)false != (bool)((sync_group >> group_index) & 0x1 ))
    {
      XMC_VADC_GROUP_SetSyncSlaveReadySignal(group_ptrs[slave_selected], slave_selected, group_index);
    }
  }
}

/*~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~*/
/* Helper function to execute the sync init sequence*/
void ADC_MEASUREMENT_ADV_lSyncSequencer(const ADC_MEASUREMENT_ADV_t *const handle_ptr,
                                         uint32_t sync_group,
                                         ADC_MEASUREMENT_ADV_SYNC_SEQ_t sequence)
{
  int8_t group_index;
  for( group_index = XMC_VADC_MAXIMUM_NUM_GROUPS - (int32_t)1; group_index >= (int32_t)0  ; group_index--)
  {
    if ( (bool)false != (bool)((sync_group >> group_index) & 0x1 ))
    {
      switch( sequence)
      {
        case ADC_MEASUREMENT_ADV_SYNC_SEQ_POWER_DOWN:
              XMC_VADC_GROUP_SetPowerMode(group_ptrs[group_index],XMC_VADC_GROUP_POWERMODE_OFF)
```

```
;
            break;
        case ADC_MEASUREMENT_ADV_SYNC_SEQ_STSEL_CONFIG:
            XMC_VADC_GROUP_SetSyncSlave(group_ptrs[group_index], handle_ptr->group_index, group_index);
            XMC_VADC_GROUP_CheckSlaveReadiness(group_ptrs[handle_ptr->group_index],group_index);
            break;
        case ADC_MEASUREMENT_ADV_SYNC_SEQ_EVAL_CONFIG:
            ADC_MEASUREMENT_ADV_lSyncEvalConfig(handle_ptr->group_index, group_index, sync_group);
        default:
            break;
      }
    }
  }
}

/*~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~*/
/* Initialization of the all the sync related functions */
__STATIC_INLINE void ADC_MEASUREMENT_ADV_lSyncInit(const ADC_MEASUREMENT_ADV_t *const handle_ptr)
{
  uint8_t sync_group;

  /* shift to get the 4 bit position needed to or it with the slave groups */
  sync_group = handle_ptr->sync_slaves | ( 1
```

```
 << handle_ptr->group_index);
  ADC_MEASUREMENT_ADV_lSyncSequencer(handle_ptr, sync_group, ADC_MEASUREMENT_ADV_SYNC_SEQ_POWER_DOWN);

  sync_group = handle_ptr->sync_slaves;
  ADC_MEASUREMENT_ADV_lSyncSequencer(handle_ptr, sync_group, ADC_MEASUREMENT_ADV_SYNC_SEQ_STSEL_CONFIG);
  ADC_MEASUREMENT_ADV_lSyncSequencer(handle_ptr, sync_group, ADC_MEASUREMENT_ADV_SYNC_SEQ_EVAL_CONFIG);

  /* Configure the iclass settings needed for the sync slaves*/
  if( (bool) false != handle_ptr->configure_globiclass1)
  {
    ADC_MEASUREMENT_ADV_SetIclass(handle_ptr);
  }

  XMC_VADC_GROUP_SetSyncMaster(group_ptrs[handle_ptr->group_index]);

  XMC_VADC_GROUP_SetPowerMode(group_ptrs[handle_ptr->group_index],XMC_VADC_GROUP_POWERMODE_NORMAL);
}
#endif

/*~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~*/
#ifdef ADC_MEASUREMENT_ADV_LOCAL_SCAN_USED
__STATIC_INLINE ADC_MEASUREMENT_ADV_STATUS_t ADC_MEASUREMENT_ADV_lScanInit(ADC_MEASUREMENT_ADV
```

```
_SCAN_t *const handle_ptr,
                    uint8_t group_index)
{
  ADC_MEASUREMENT_ADV_STATUS_t status;
  /*Initialization of APP 'ADCGroup'*/
  status = (ADC_MEASUREMENT_ADV_STATUS_t) GLOBAL_ADC_Init(ADC_MEASUREMENT_ADV_GLOBAL_HANDLE);
  XMC_VADC_GROUP_InputClassInit(group_ptrs[group_index], handle_ptr->iclass_config_handle,
                                XMC_VADC_GROUP_CONV_STD, (uint32_t)handle_ptr->iclass_num);
  /*Initialization of scan request source*/
  XMC_VADC_GROUP_ScanInit(group_ptrs[group_index], handle_ptr->scan_config_handle);
  /* Configure the gating mode for Scan*/
  XMC_VADC_GROUP_ScanSetGatingMode(group_ptrs[group_index], handle_ptr->gating_mode);
  /*Interrupt Configuration*/
  if ((bool)true == handle_ptr->rs_intr_handle.interrupt_enable)
  {
#if (UC_FAMILY == XMC1)
    NVIC_SetPriority((IRQn_Type)handle_ptr->rs_intr_handle.node_id, handle_ptr->rs_intr_handle.priority);
#else
    NVIC_SetPriority((IRQn_Type)handle_ptr->rs_intr_handle.node_id,
                       NVIC_EncodePriority(NVIC_GetPriorityGrouping(),
```

```
                              handle_ptr->rs_intr_handle.priority,handle_ptr->rs_intr_handle.sub_priority));
#endif
#ifdef ADC_MEASUREMENT_ADV_NON_DEFAULT_IRQ_SOURCE_SELECTED
    XMC_SCU_SetInterruptControl(handle_ptr->rs_intr_handle.node_id,
                                ((handle_ptr->rs_intr_handle.node_id << 8) | handle_ptr->rs_intr_handle.irqctrl));
#endif

    /* Connect RS Events to NVIC nodes */
    XMC_VADC_GROUP_ScanSetReqSrcEventInterruptNode(group_ptrs[group_index], handle_ptr->srv_req_node);
  }

  return (status);
}
#endif
/*~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~*/
#ifdef ADC_MEASUREMENT_ADV_LOCAL_QUEUE_USED
__STATIC_INLINE ADC_MEASUREMENT_ADV_STATUS_t ADC_MEASUREMENT_ADV_lQueueInit(ADC_MEASUREMENT_ADV_QUEUE_t *const handle_ptr,
                                                                               uint8_t group_index)
{
  ADC_MEASUREMENT_ADV_STATUS_t status;

  /*Initialization of APP 'GLOBAL_ADC'*/
  status = (ADC_MEASUREMENT_ADV_STATUS_t) GLOBAL_ADC_Init(ADC_MEASUREMENT_ADV_GLOBAL_HANDLE);
```

```

  /*Class Configuration*/
  XMC_VADC_GROUP_InputClassInit(group_ptrs[group_index],handle_ptr->iclass_config_handle,
                                XMC_VADC_GROUP_CONV_STD,handle_ptr->iclass_num);

  /* Initialize the Queue hardware */
  XMC_VADC_GROUP_QueueInit(group_ptrs[group_index],handle_ptr->queue_config_handle);

  /* Configure the gating mode for queue*/
  XMC_VADC_GROUP_QueueSetGatingMode(group_ptrs[group_index], handle_ptr->gating_mode);

  /*Interrupt Configuration*/
  if ((bool)true == handle_ptr->rs_intr_handle.interrupt_enable)
  {
#if (UC_FAMILY == XMC1)
    NVIC_SetPriority((IRQn_Type)handle_ptr->rs_intr_handle.node_id, handle_ptr->rs_intr_handle.priority);
#else
    NVIC_SetPriority((IRQn_Type)handle_ptr->rs_intr_handle.node_id,
                     NVIC_EncodePriority(NVIC_GetPriorityGrouping(),
                     handle_ptr->rs_intr_handle.priority,handle_ptr->rs_intr_handle.sub_priority));
#endif
#ifdef ADC_MEASUREMENT_ADV_NON_DEFAULT_IRQ_SOURCE_SELECTED
    XMC_SCU_SetInterruptControl(handle_ptr->rs_intr_handle.node_id,
                                ((handle_ptr
```

```
->rs_intr_handle.node_id << 8) | handle_ptr->rs_intr_handle.irqctrl));
#endif

    /* Connect RS Events to NVIC nodes */
    XMC_VADC_GROUP_QueueSetReqSrcEventInterruptNode(group_ptrs[group_index], (XMC_VADC_SR_t)handle_ptr->srv_req_node);
  }

  return (status);
}
#endif
/*~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~*/
/* Local function to do the request source initialization.*/
__STATIC_INLINE ADC_MEASUREMENT_ADV_STATUS_t ADC_MEASUREMENT_ADV_lRequestSrcInit(const ADC_MEASUREMENT_ADV_t
                                                                                  *const handle_ptr)
{
  ADC_MEASUREMENT_ADV_STATUS_t status;

#ifdef ADC_MEASUREMENT_ADV_SCAN_USED
  #ifdef ADC_MEASUREMENT_ADV_QUEUE_USED
    if ( ADC_MEASUREMENT_ADV_REQUEST_SOURCE_LOCAL_SCAN >= handle_ptr->req_src)
  #endif
    {
#ifdef ADC_MEASUREMENT_ADV_LOCAL_SCAN_USED
  #ifdef ADC_MEASUREMENT_ADV_ADC_SCAN_USED
      if ( ADC_MEASUREMENT_ADV_REQUEST_SOURCE_SCAN != handle_ptr->req_src)
```

```
  #endif
      {
        status = ADC_MEASUREMENT_ADV_lScanInit(handle_ptr->local_scan_handle,handle_ptr->group_index);
      }
#endif

#ifdef ADC_MEASUREMENT_ADV_ADC_SCAN_USED
  #ifdef ADC_MEASUREMENT_ADV_LOCAL_SCAN_USED
      else
  #endif
      {
        /* Call the function to initialise Clock and ADC global functional units*/
        status = (ADC_MEASUREMENT_ADV_STATUS_t) ADC_SCAN_Init(handle_ptr->scan_handle);
      }
#endif
    }
#endif

#ifdef ADC_MEASUREMENT_ADV_QUEUE_USED
  #ifdef ADC_MEASUREMENT_ADV_SCAN_USED
    else
  #endif
    {
#ifdef ADC_MEASUREMENT_ADV_LOCAL_QUEUE_USED
  #ifdef ADC_MEASUREMENT_ADV_ADC_QUEUE_USED
      if ( ADC_MEASUREMENT_ADV_REQUEST_SOURCE_QUEUE != handle_ptr->req_src)
  #endif
      {
        status = ADC_MEASUREMENT_ADV_lQueueInit(handle_ptr->local_queue_handle,handle_ptr->group_index);
      }
```

```
#endif

#ifdef ADC_MEASUREMENT_ADV_ADC_QUEUE_USED
  #ifdef ADC_MEASUREMENT_ADV_LOCAL_QUEUE_USED
      else
  #endif
      {
        /* Call the function to initialise Clock and ADC global functional units*/
        status = (ADC_MEASUREMENT_ADV_STATUS_t) ADC_QUEUE_Init(handle_ptr->queue_handle);
      }
#endif
    }
#endif
    return (status);
}

/*~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~*/
#ifdef ADC_MEASUREMENT_ADV_LOCAL_QUEUE_USED
/* Local function to insert the queue entries into the hardware.*/
__STATIC_INLINE void ADC_MEASUREMENT_ADV_lQueueInsertEntries(const ADC_MEASUREMENT_ADV_t *const handle_ptr)
{
  uint32_t entry_index;

  XMC_VADC_GROUP_t *queue_group_ptr = group_ptrs[handle_ptr->group_index];
  const XMC_VADC_QUEUE_ENTRY_t **const entries_array = handle_ptr->local_queue_entries;

  for(entry_index = 0; entry_index < handle_
```

```
ptr->total_number_of_entries; entry_index++)
  {
    XMC_VADC_GROUP_QueueInsertChannel(queue_group_ptr, *entries_array[entry_index]);
  }
}
#endif

/*~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~*/
__STATIC_INLINE bool ADC_MEASUREMENT_ADV_lArbitrationStatus(const ADC_MEASUREMENT_ADV_t *const handle_ptr)
{
  bool clock_reset_check;
  bool arbitration_status;

#if !defined(CLOCK_GATING_SUPPORTED) || !defined(ADC_MEASUREMENT_ADV_CHECK_CLOCK_GATING)
  clock_reset_check = (bool)false;
#endif
  arbitration_status = (bool)false;

  /* To check if the arbiter is already enabled. Before checking this ensure that clock and reset states are correct */
#if defined(CLOCK_GATING_SUPPORTED) && defined(ADC_MEASUREMENT_ADV_CHECK_CLOCK_GATING)
  clock_reset_check = !XMC_SCU_CLOCK_IsPeripheralClockGated(XMC_SCU_PERIPHERAL_CLOCK_VADC);
#endif
#ifdef PERIPHERAL_RESET_SUPPORTED
  clock_reset_check |= !XMC_SCU_RESET_IsPeripheralResetAsserted(XMC_SCU_PERIPHERAL_RESET_VADC);
#endif
```

```
  if(clock_reset_check != (bool)false)
  {
#ifdef ADC_MEASUREMENT_ADV_SCAN_USED
  #ifdef ADC_MEASUREMENT_ADV_QUEUE_USED
    if ( ADC_MEASUREMENT_ADV_REQUEST_SOURCE_LOCAL_SCAN >= handle_ptr->req_src)
  #endif
      {
        arbitration_status = XMC_VADC_GROUP_ScanIsArbitrationSlotEnabled(group_ptrs[handle_ptr->group_index]);
      }
#endif

#ifdef ADC_MEASUREMENT_ADV_QUEUE_USED
  #ifdef ADC_MEASUREMENT_ADV_SCAN_USED
      else
  #endif
      {
        arbitration_status = XMC_VADC_GROUP_QueueIsArbitrationSlotEnabled(group_ptrs[handle_ptr->group_index]);
      }
#endif
  }
  return (arbitration_status);
}

/*~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~*/
__STATIC_INLINE void ADC_MEASUREMENT_ADV_lDisableArbitration(const ADC_MEASUREMENT_ADV_t *const handle_ptr,
                                                  bool arbitration_status)
{
```

```
  if(arbitration_status == (bool)false)
  {
#ifdef ADC_MEASUREMENT_ADV_SCAN_USED
  #ifdef ADC_MEASUREMENT_ADV_QUEUE_USED
      if ( ADC_MEASUREMENT_ADV_REQUEST_SOURCE_LOCAL_SCAN >= handle_ptr->req_src)
  #endif
      {
        XMC_VADC_GROUP_ScanDisableArbitrationSlot(group_ptrs[handle_ptr->group_index]);
      }
#endif

#ifdef ADC_MEASUREMENT_ADV_QUEUE_USED
  #ifdef ADC_MEASUREMENT_ADV_SCAN_USED
      else
  #endif
      {
        XMC_VADC_GROUP_QueueDisableArbitrationSlot(group_ptrs[handle_ptr->group_index]);
      }
#endif
  }
}

/*~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~*/
/* Insert channels into the hardware*/
void ADC_MEASUREMENT_ADV_lInsertChannels(const ADC_MEASUREMENT_ADV_t *const handle_ptr)
{
  XMC_ASSERT("ADC_MEASUREMENT_ADV_InsertChannels:Invalid handle_ptr", (handle_ptr != NULL))

#ifdef ADC_MEASUREMENT_ADV_SCAN_USED
  #ifdef ADC_MEASUREMENT_ADV_QUEUE_USED
```

```
    if ( ADC_MEASUREMENT_ADV_REQUEST_SOURCE_LOCAL_SCAN >= handle_ptr->req_src)
  #endif
    {
#ifdef ADC_MEASUREMENT_ADV_LOCAL_SCAN_USED
  #ifdef ADC_MEASUREMENT_ADV_ADC_SCAN_USED
      if ( ADC_MEASUREMENT_ADV_REQUEST_SOURCE_SCAN != handle_ptr->req_src)
  #endif
      {
        XMC_VADC_GROUP_ScanAddMultipleChannels(group_ptrs[handle_ptr->group_index], handle_ptr->local_scan_handle->insert_mask);
      }
#endif

#ifdef ADC_MEASUREMENT_ADV_ADC_SCAN_USED
  #ifdef ADC_MEASUREMENT_ADV_LOCAL_SCAN_USED
      else
  #endif
      {
        ADC_SCAN_AllEntriesInserted(handle_ptr->scan_handle);
      }
#endif
    }
#endif

#ifdef ADC_MEASUREMENT_ADV_QUEUE_USED
  #ifdef ADC_MEASUREMENT_ADV_SCAN_USED
    else
  #endif
    {
#ifdef ADC_MEASUREMENT_ADV_LOCAL_QUEUE_USED
  #ifdef ADC_MEASUREMENT_ADV_ADC_QUEUE_USED
      if ( ADC_MEASUREMENT_ADV_REQUEST_SOURCE_QUEUE != handle_ptr->req_src)
```

```
  #endif
      {
        ADC_MEASUREMENT_ADV_lQueueInsertEntries(handle_ptr);
      }
#endif

#ifdef ADC_MEASUREMENT_ADV_ADC_QUEUE_USED
  #ifdef ADC_MEASUREMENT_ADV_LOCAL_QUEUE_USED
      else
  #endif
      {
        ADC_QUEUE_AllEntriesInserted(handle_ptr->queue_handle);
      }
#endif
    }
#endif
}

/*~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~*/
/* Select the boundary for a channel and configure its value as well.*/
void ADC_MEASUREMENT_ADV_lSetBoundary(const ADC_MEASUREMENT_ADV_CHANNEL_t *const handle_ptr,
                                      XMC_VADC_CHANNEL_BOUNDARY_t boundary_select,
                                      uint32_t boundary_value)
{
  XMC_ASSERT("ADC_MEASUREMENT_ADV_SetBoundary:Invalid handle_ptr", (handle_ptr != NULL))

  switch(boundary_select)
```

```
  {
    case XMC_VADC_CHANNEL_BOUNDARY_GROUP_BOUND0:
    case XMC_VADC_CHANNEL_BOUNDARY_GROUP_BOUND1:
         XMC_VADC_GROUP_SetIndividualBoundary(group_ptrs[handle_ptr->group_index], boundary_select,
                                              (uint16_t)boundary_value);
         break;

    case XMC_VADC_CHANNEL_BOUNDARY_GLOBAL_BOUND0:
    case XMC_VADC_CHANNEL_BOUNDARY_GLOBAL_BOUND1:
         XMC_VADC_GLOBAL_SetIndividualBoundary(ADC_MEASUREMENT_ADV_GLOBAL_PTR,
                                               boundary_select,
                                               (uint16_t)boundary_value);
         break;
 }
}
/*~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~*/
#ifndef ADC_MEASUREMENT_ADV_SYNC_USED
/* Address the errata for the incorrect conversion.*/
void ADC_MEASUREMENT_ADV_lSyncADCClocks(void)
{
  int32_t group_index;

  for (group_index = (int32_t)XMC_VADC_MAXIM
```

```
UM_NUM_GROUPS - (int32_t)1; group_index >= (int32_t)0  ; group_index--)
  {
    XMC_VADC_GROUP_SetPowerMode(group_ptrs[group_index],XMC_VADC_GROUP_POWERMODE_OFF);
  }

  for (group_index = (int32_t)XMC_VADC_MAXIMUM_NUM_GROUPS - (int32_t)1; group_index > (int32_t)0  ; group_index--)
  {
    XMC_VADC_GROUP_SetSyncSlave(group_ptrs[group_index], (uint32_t)0, (uint32_t)group_index);

    XMC_VADC_GROUP_CheckSlaveReadiness(group_ptrs[0U], (uint32_t)group_index);
  }

  XMC_VADC_GROUP_SetSyncMaster(group_ptrs[0U]);

  XMC_VADC_GROUP_SetPowerMode(group_ptrs[0U],XMC_VADC_GROUP_POWERMODE_NORMAL);
}
#endif
/*****************************************************************************************************************
 * API IMPLEMENTATION
 *****************************************************************************************************************/

/*This function returns the version of the ADC_MEASUREMENT App*/
DAVE_APP_VERSION_t ADC_MEASUREMENT_ADV_GetAppVersion(void)
```

```c
{
  DAVE_APP_VERSION_t version;

  version.major = (uint8_t) ADC_MEASUREMENT_ADV_MAJOR_VERSION;
  version.minor = (uint8_t) ADC_MEASUREMENT_ADV_MINOR_VERSION;
  version.patch = (uint8_t) ADC_MEASUREMENT_ADV_PATCH_VERSION;

  return version;
}

/*~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~*/
/* Enables the arbiter of the selected request source*/
void ADC_MEASUREMENT_ADV_StartADC(const ADC_MEASUREMENT_ADV_t *const handle_ptr)
{
#ifdef ADC_MEASUREMENT_ADV_SCAN_USED
  #ifdef ADC_MEASUREMENT_ADV_QUEUE_USED
    if ( ADC_MEASUREMENT_ADV_REQUEST_SOURCE_LOCAL_SCAN >= handle_ptr->req_src)
  #endif
      {
        XMC_VADC_GROUP_ScanEnableArbitrationSlot(group_ptrs[handle_ptr->group_index]);
      }
#endif

#ifdef ADC_MEASUREMENT_ADV_QUEUE_USED
  #ifdef ADC_MEASUREMENT_ADV_SCAN_USED
      else
  #endif
      {
```

```
        XMC_VADC_GROUP_QueueEnableArbitrationSlot(group_ptrs[handle_ptr->group_index]);
      }
#endif
}

/*~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~*/
/* Starts the ADC conversions by causing a software start of conversion*/
void ADC_MEASUREMENT_ADV_SoftwareTrigger(const ADC_MEASUREMENT_ADV_t *const handle_ptr)
{
  XMC_ASSERT("ADC_MEASUREMENT_ADV_StartConversion:Invalid handle_ptr", (handle_ptr != NULL))

#ifdef ADC_MEASUREMENT_ADV_SCAN_USED
  #ifdef ADC_MEASUREMENT_ADV_QUEUE_USED
    if ( ADC_MEASUREMENT_ADV_REQUEST_SOURCE_LOCAL_SCAN >= handle_ptr->req_src)
  #endif
    {
      XMC_VADC_GROUP_ScanTriggerConversion(group_ptrs[handle_ptr->group_index]);
    }
#endif
#ifdef ADC_MEASUREMENT_ADV_QUEUE_USED
  #ifdef ADC_MEASUREMENT_ADV_SCAN_USED
    else
  #endif
    {
      XMC_VADC_GROUP_QueueTriggerConversion(group_ptrs[handle_ptr->group_index]);
    }
#endif
}
```

```
/*~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~*/
/* Enables the NVIC(if needed) when scan/queue request source is consumed internally in the APP. */
void ADC_MEASUREMENT_ADC_lNvicEnable(const ADC_MEASUREMENT_ADV_t *const handle_ptr)
{
#ifdef ADC_MEASUREMENT_ADV_LOCAL_SCAN_USED
    if (((bool)true == handle_ptr->local_scan_handle->rs_intr_handle.interrupt_enable) &&
        (ADC_MEASUREMENT_ADV_REQUEST_SOURCE_LOCAL_SCAN == handle_ptr->req_src))
    {
      NVIC_EnableIRQ((IRQn_Type)handle_ptr->local_scan_handle->rs_intr_handle.node_id);
    }
#endif
#ifdef ADC_MEASUREMENT_ADV_LOCAL_QUEUE_USED
    if (((bool)true == handle_ptr->local_queue_handle->rs_intr_handle.interrupt_enable) &&
        (ADC_MEASUREMENT_ADV_REQUEST_SOURCE_LOCAL_QUEUE == handle_ptr->req_src))
    {
      NVIC_EnableIRQ((IRQn_Type)handle_ptr->local_queue_handle->rs_intr_handle.node_id);
    }
#endif
}

/*~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~*/
/* Configures the result results . */
```

```
__STATIC_INLINE void ADC_MEASUREMENT_ADC_lResultInit(const ADC_MEASUREMENT_ADV_CHANNEL_t *indexed)
{
#ifdef ADC_MEASUREMENT_ADV_FIFO_USED
  uint8_t fifo_num_of_intermediate_stages;
  uint8_t fifo_index;
  uint8_t fifo_head;
#endif
#ifdef ADC_MEASUREMENT_ADV_FIFO_USED
  /* If FIFO is selected for the particular channel then do the FIFO initializations*/
  if ( (uint32_t)0 != indexed->max_fifo_required)
  {
    /*Excluding the head and tail from the total number of FIFO elements needed*/
    fifo_num_of_intermediate_stages = indexed->max_fifo_required - ADC_MEASUREMENT_ADV_RESERVED_REGISTERS;

    fifo_head = (uint8_t)indexed->ch_handle->result_reg_number;
    for (fifo_index = 1; fifo_index <= fifo_num_of_intermediate_stages; fifo_index++)
    {
      XMC_VADC_GROUP_ResultInit(group_ptrs[indexed->group_index], (uint32_t)fifo_head - fifo_index,
                                &ADC_MEASUREMENT_ADV_fifo_intermediate_stage);
      }

     /* For the FIFO Tail configuration*/
      XMC_VADC_GROUP_ResultInit(group_ptrs[indexed->group_index], (uint32_t)indexed->result_fifo_tail_number,
```

```
                                indexed->res_handle[ADC_MEASUREMENT_ADV_TAIL_RESULT_REG_CONFIG]);
  }
#endif
      /* Initialize for configured result registers For FIFO Head configuration*/
      XMC_VADC_GROUP_ResultInit(group_ptrs[indexed->group_index], (uint32_t)indexed->ch_handle->result_reg_number,
                                indexed->res_handle[ADC_MEASUREMENT_ADV_HEAD_RESULT_REG_CONFIG]);
}

/*~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~*/
/* Initialization routine to call ADC LLD API's */
ADC_MEASUREMENT_ADV_STATUS_t ADC_MEASUREMENT_ADV_Init(const ADC_MEASUREMENT_ADV_t *const handle_ptr)
{
  XMC_ASSERT("ADC_MEASUREMENT_ADV_Init:Invalid handle_ptr", (handle_ptr != NULL))

  const ADC_MEASUREMENT_ADV_CHANNEL_t *indexed;
  uint8_t ch_num;
  uint8_t total_number_of_channels;
  ADC_MEASUREMENT_ADV_STATUS_t status;
#ifdef ADC_MEASUREMENT_ADV_SHS_GAIN_NON_DEFAULT
  uint8_t channel_number;
#endif
  bool arbitration_status = (bool)false;
```

```

  if (ADC_MEASUREMENT_ADV_STATUS_UNINITIALIZED == *handle_ptr->init_state)
  {

    arbitration_status = ADC_MEASUREMENT_ADV_lArbitrationStatus(handle_ptr);

   /* Initialize the scan/queue request source.*/
   status = ADC_MEASUREMENT_ADV_lRequestSrcInit(handle_ptr);

   /* Disable the Arbitration if no other instance has enabled it*/
   ADC_MEASUREMENT_ADV_lDisableArbitration(handle_ptr,arbitration_status);

#ifdef ADC_MEASUREMENT_ADV_SYNC_USED
  #ifdef ADC_MEASUREMENT_ADV_SYNC_NOT_ALL_USED
    if ((uint32_t)0 != handle_ptr->sync_slaves)
  #endif
    {
      /*  Configure the Sync conversion operation */
      ADC_MEASUREMENT_ADV_lSyncInit(handle_ptr);
    }
#else
   ADC_MEASUREMENT_ADV_lSyncADCClocks();
#endif

    /* Initialize the SR lines for the Channel event and the Result event, if required*/
#ifdef ADC_MEASUREMENT_ADV_MUX_USED
```

```
  #ifdef ADC_MEASUREMENT_ADV_MUX_NOT_ALL_USED
    if (handle_ptr->event_config != NULL)
  #endif
    {
      (handle_ptr->event_config)();
    }
#endif

    total_number_of_channels = (uint8_t)handle_ptr->total_number_of_channels;
    for (ch_num = (uint8_t)0; ch_num < (uint8_t)total_number_of_channels; ch_num++)
    {
      indexed = handle_ptr->channel_array[ch_num];

      /* Initialize for configured channels*/
      XMC_VADC_GROUP_ChannelInit(group_ptrs[indexed->group_index],(uint32_t)indexed->ch_num, indexed->ch_handle);

#if (XMC_VADC_SHS_AVAILABLE == 1U)
  #ifdef ADC_MEASUREMENT_ADV_SHS_GAIN_NON_DEFAULT
      channel_number = indexed->ch_num;
    #ifdef ADC_MEASUREMENT_ADV_SHS_GAIN_ALIAS
      if (indexed->ch_handle->alias_channel != XMC_VADC_CHANNEL_ALIAS_DISABLED)
      {
         channel_number = indexed->ch_handle->alias_channel;
      }
    #endif
      XMC_VADC_GLOBAL_SHS_SetGainFactor(ADC_
```

```
MEASUREMENT_ADV_SHS_PTR,
                                                       (uint8_t)indexed->shs_gain_factor,
                                                       (XMC_VADC_GROUP_INDEX_t)indexed->group_index,
                                                       channel_number);
  #endif
#endif

      /* Result Init both with and without FIFO */
      ADC_MEASUREMENT_ADC_lResultInit(indexed);

#ifdef ADC_MEASUREMENT_ADV_ANALOG_IO_USED
      /* ANALOG_IO initialization for the channel*/
#ifndef ADC_MEASUREMENT_ADV_ANALOG_IO_ALL_CHANNELS_USED
      if(indexed->analog_io_config != NULL)
#endif
      {
        status |= (ADC_MEASUREMENT_ADV_STATUS_t) ANALOG_IO_Init(indexed->analog_io_config);
      }
#endif
    }

#if defined(ADC_MEASUREMENT_ADV_ADC_SCAN_USED) || defined(ADC_MEASUREMENT_ADV_ADC_QUEUE_USED)
    /* Load the queue/scan entries into ADC_QUEUE/ADC_SCAN.
     * This would load the scan/ queue entries into the software buffers in the ADC_SCAN/ADC_QUEUE APPs.
     * A call to this API would only configu
```

```
re the ADC_SCAN/ADC_QUEUE software buffers and will not be
     * programmed into the Hardware. The programming into the hardware is taken care by another API.
     */
#if defined(ADC_MEASUREMENT_ADV_LOCAL_SCAN_USED) || defined(ADC_MEASUREMENT_ADV_LOCAL_QUEUE_USED)
    if( (ADC_MEASUREMENT_ADV_REQUEST_SOURCE_SCAN == handle_ptr->req_src) ||
        (ADC_MEASUREMENT_ADV_REQUEST_SOURCE_QUEUE == handle_ptr->req_src))
#endif
    {
      for (ch_num = (uint8_t)0; ch_num < (uint8_t)handle_ptr->total_number_of_entries; ch_num++)
      {
        ADC_MEASUREMENT_ADV_lInsertEntry(handle_ptr,ch_num);
      }
    }
#endif

    /* Enables the NVIC node if NVIC node is consumed inside the APP*/
    ADC_MEASUREMENT_ADC_lNvicEnable(handle_ptr);

    /* Load the queue/scan entries into the hardware */
    ADC_MEASUREMENT_ADV_lInsertChannels(handle_ptr);

    /*Start the arbiter of the ADC request source after the initialization. */
```

```
#ifdef ADC_MEASUREMENT_ADV_START_ADC
  #ifdef ADC_MEASUREMENT_ADV_NOT_ALL_REQ_START
    if ((bool)false  != handle_ptr->start_at_initialization)
  #endif
    {
      ADC_MEASUREMENT_ADV_StartADC(handle_ptr);
    }
#endif

    *handle_ptr->init_state = status;
  }
  return (*handle_ptr->init_state);
}

/*~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~*/
/* Set the Fast compare value*/
ADC_MEASUREMENT_ADV_STATUS_t ADC_MEASUREMENT_ADV_SetFastCompareValue(const ADC_MEASUREMENT_ADV_CHANNEL_t
                                                                     *const handle_ptr, uint16_t compare_value)
{
  ADC_MEASUREMENT_ADV_STATUS_t status;
  XMC_ASSERT("ADC_MEASUREMENT_ADV_SetFastCompareValue:Invalid handle_ptr", (handle_ptr != NULL))

  status = ADC_MEASUREMENT_ADV_STATUS_FAILURE;

  if ( (uint32_t)compare_value <= ADC_MEASUR
```

```
EMENT_ADV_10_BIT_MAX_VALUE)
  {
    XMC_VADC_GROUP_SetResultFastCompareValue(group_ptrs[handle_ptr->group_index],
 (uint32_t)  handle_ptr->ch_handle->result_reg_number,
 (XMC_VADC_RESULT_SIZE_t)compare_value);
    status = ADC_MEASUREMENT_ADV_STATUS_SUCCESS;
  }
  return (status);
}

/*~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~*/
/* Set the Subtraction value */
void ADC_MEASUREMENT_ADV_SetSubtractionValue(const ADC_MEASUREMENT_ADV_t *const handle_ptr,
ADC_MEASUREMENT_ADV_SUBTRATION_t subtraction_alignment,
 uint16_t subtraction_value)
{
  uint32_t groups;
  uint8_t i;
  XMC_ASSERT("ADC_MEASUREMENT_ADV_SetSubtractionValue:Invalid handle_ptr", (handle_ptr != NULL))

#ifdef ADC_MEASUREMENT_ADV_SYNC_USED
  groups = handle_ptr->sync_slaves;
#else
  groups = (uint32_t)0;
```

```
#endif
  groups |= (uint32_t)((uint32_t)1 << (uint32_t)handle_ptr->group_index);
  for ( i = (uint8_t)0; i < (uint8_t)XMC_VADC_MAXIMUM_NUM_GROUPS ; i++)
  {
    if ( (bool)false != (bool)((groups >> i) & (uint32_t)0x1 ))
    {
      XMC_VADC_GROUP_SetResultSubtractionValue(group_ptrs[i], (uint16_t)(subtraction_value
                                     << (uint32_t)subtraction_alignment));
    }
  }

}

/*~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~*/
/* Configure the resolution and sampling time in an iclass */
void ADC_MEASUREMENT_ADV_ConfigureChannelClass(const ADC_MEASUREMENT_ADV_CHANNEL_t *const handle_ptr,
   const XMC_VADC_GROUP_CLASS_t *config)
{
  XMC_ASSERT("ADC_MEASUREMENT_ADV_ConfigureChannelClass:Invalid class configuration", (config != NULL))

  XMC_VADC_GROUP_InputClassInit(group_ptrs[handle_ptr->group_index], *config, XMC_VADC_GROUP_CONV_STD,
```

```
                                              (uint32_t)handle_ptr->ch_handle->input_class);
}

/*~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~*/
/* Sets the alternate reference for a particular channel*/
void ADC_MEASUREMENT_ADV_SetAlternateReference(const ADC_MEASUREMENT_ADV_CHANNEL_t *const handle_ptr,
   const XMC_VADC_CHANNEL_REF_t reference_select)
{
  XMC_ASSERT("ADC_MEASUREMENT_ADV_SetAlternateReference:Invalid handle_ptr", (handle_ptr != NULL))

  XMC_VADC_GROUP_ChannelSetInputReference(group_ptrs[handle_ptr->group_index], (uint32_t)handle_ptr->ch_num,
                                          reference_select);

}

#if (XMC_VADC_SHS_AVAILABLE == 1U)
/*~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~*/
/* Sets the gain ratio for a particular channel*/
void ADC_MEASUREMENT_ADV_SetChannelGain(const ADC_MEASUREMENT_ADV_CHANNEL_t *const handle_ptr,
                                        const ADC_MEASUREMENT_ADV_GAIN_t gain_factor)
```

```
{
  uint8_t channel_number;
  XMC_ASSERT("ADC_MEASUREMENT_ADV_SetChannelGain:Invalid handle_ptr", (handle_ptr != NULL))

  channel_number = handle_ptr->ch_num;
#ifdef ADC_MEASUREMENT_ADV_SHS_GAIN_ALIAS
  if (handle_ptr->ch_handle->alias_channel != XMC_VADC_CHANNEL_ALIAS_DISABLED)
  {
    channel_number = (uint8_t) handle_ptr->ch_handle->alias_channel;
  }
#endif
  XMC_VADC_GLOBAL_SHS_SetGainFactor(ADC_MEASUREMENT_ADV_SHS_PTR,
                                    (uint8_t)gain_factor,
                                    (XMC_VADC_GROUP_INDEX_t)handle_ptr->group_index,
                                    (uint32_t)channel_number);
}
#endif

/*~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~*/
/* Select the boundary for the channel*/
void ADC_MEASUREMENT_ADV_SelectBoundary(const ADC_MEASUREMENT_ADV_CHANNEL_t *const handle_ptr,
                                        XMC_VADC_BOUNDARY_SELECT_t boundary,
                                        XMC_VADC_CHANNEL_BOUNDARY_t boundary_selection)
{
  XMC_ASSERT("ADC_MEASUREMENT_ADV_SelectBoun
```

```
dary:Invalid handle_ptr", (handle_ptr != NULL))

  XMC_VADC_GROUP_ChannelSetBoundarySelection(group_ptrs[handle_ptr->group_index], (uint32_t)handle_ptr->ch_num,
                                             boundary, boundary_selection);

}

/*~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~*/
/* configure the upper boundary for a channel.*/
void ADC_MEASUREMENT_ADV_SetBoundaryUpper(const ADC_MEASUREMENT_ADV_CHANNEL_t *const handle_ptr,
                                          uint32_t boundary_value)
{
  uint32_t boundary_select;
  XMC_ASSERT("ADC_MEASUREMENT_ADV_SetBoundary:Invalid handle_ptr", (handle_ptr != NULL))

  boundary_select = handle_ptr->ch_handle->upper_boundary_select;

  ADC_MEASUREMENT_ADV_lSetBoundary(handle_ptr, (XMC_VADC_CHANNEL_BOUNDARY_t)boundary_select, boundary_value);
}

/*~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~*/
/* configure the lower boundary for a channe
```

```
l.*/
void ADC_MEASUREMENT_ADV_SetBoundaryLower(const ADC_MEASUREMENT_ADV_CHANNEL_t *const handle_ptr,
                                          uint32_t boundary_value)
{
  uint32_t boundary_select;
  XMC_ASSERT("ADC_MEASUREMENT_ADV_SetBoundary:Invalid handle_ptr", (handle_ptr != NULL))

  boundary_select = handle_ptr->ch_handle->lower_boundary_select;

  ADC_MEASUREMENT_ADV_lSetBoundary(handle_ptr, (XMC_VADC_CHANNEL_BOUNDARY_t)boundary_select, boundary_value);
}


/*~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~*/
/* Aliased channel number is returned if the channel has alias enabled */
XMC_VADC_CHANNEL_ALIAS_t ADC_MEASUREMENT_ADV_GetAliasValue(const ADC_MEASUREMENT_ADV_CHANNEL_t *const handle_ptr)
{
  XMC_VADC_CHANNEL_ALIAS_t return_value;
  ADC_MEASUREMENT_ADV_ALIAS_t alias_value;

  XMC_ASSERT("ADC_MEASUREMENT_ADV_GetAliasValue:Invalid handle_ptr", (handle_ptr != NULL))

  alias_value.alias = XMC_VADC_GROUP_GetAlias(group_ptrs[handle_ptr->group_index]);
```

```
  if ((uint8_t)0 == handle_ptr->ch_num )
  {
    return_value = (XMC_VADC_CHANNEL_ALIAS_t)alias_value.alias0;
    if ((uint32_t)0 == alias_value.alias0)
    {
      return_value = XMC_VADC_CHANNEL_ALIAS_DISABLED;
    }
  }
  else if ((uint8_t)1 == handle_ptr->ch_num)
  {
    return_value = (XMC_VADC_CHANNEL_ALIAS_t)alias_value.alias1;
    if ((uint32_t)1 == alias_value.alias1)
    {
      return_value = XMC_VADC_CHANNEL_ALIAS_DISABLED;
    }
  }
  else
  {
    return_value = XMC_VADC_CHANNEL_ALIAS_DISABLED;
  }

  return(return_value);

}
/*~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~*/

#ifdef ADC_MEASUREMENT_ADV_SYNC_USED
/* Enables uniform conversion configurations across slaves*/
```

```
void ADC_MEASUREMENT_ADV_SetIclass(const ADC_MEASUREMENT_ADV_t *const handle_ptr)
{
  XMC_VADC_CHANNEL_CONV_t req_iclass;
  XMC_VADC_GROUP_CLASS_t conv_class;
  XMC_VADC_GLOBAL_CLASS_t conv_class_global;

  XMC_ASSERT("ADC_MEASUREMENT_ADV_SetIclass:Invalid handle_ptr", (handle_ptr != NULL))

  req_iclass = ADC_MEASUREMENT_ADV_lGetIclass(handle_ptr);
  conv_class = XMC_VADC_GROUP_GetInputClass(group_ptrs[handle_ptr->group_index], req_iclass);
  conv_class_global.globiclass = conv_class.g_iclass0;
  XMC_VADC_GLOBAL_InputClassInit(ADC_MEASUREMENT_ADV_GLOBAL_PTR, conv_class_global,
                                 XMC_VADC_GROUP_CONV_STD, (uint32_t)ADC_MEASUREMENT_ADV_GLOBICLASS1);

}
#endif
```