55 HAL RTC Extension Driver

55.1 RTCEx Firmware driver registers structures

55.1.1 RTC_TamperTypeDef

Data Fields

- ***uint32_t Tamper***
- ***uint32_t Interrupt***
- ***uint32_t Trigger***
- ***uint32_t NoErase***
- ***uint32_t MaskFlag***
- ***uint32_t Filter***
- ***uint32_t SamplingFrequency***
- ***uint32_t PrechargeDuration***
- ***uint32_t TamperPullUp***
- ***uint32_t TimeStampOnTamperDetection***

Field Documentation

- ***uint32_t RTC_TamperTypeDef::Tamper***
  Specifies the Tamper Pin. This parameter can be a value of ***RTCEx_Tamper_Pins_Definitions***
- ***uint32_t RTC_TamperTypeDef::Interrupt***
  Specifies the Tamper Interrupt. This parameter can be a value of ***RTCEx_Tamper_Interrupt_Definitions***
- ***uint32_t RTC_TamperTypeDef::Trigger***
  Specifies the Tamper Trigger. This parameter can be a value of ***RTCEx_Tamper_Trigger_Definitions***
- ***uint32_t RTC_TamperTypeDef::NoErase***
  Specifies the Tamper no erase mode. This parameter can be a value of ***RTCEx_Tamper_EraseBackUp_Definitions***
- ***uint32_t RTC_TamperTypeDef::MaskFlag***
  Specifies the Tamper Flag masking. This parameter can be a value of ***RTCEx_Tamper_MaskFlag_Definitions***
- ***uint32_t RTC_TamperTypeDef::Filter***
  Specifies the RTC Filter Tamper. This parameter can be a value of ***RTCEx_Tamper_Filter_Definitions***
- ***uint32_t RTC_TamperTypeDef::SamplingFrequency***
  Specifies the sampling frequency. This parameter can be a value of ***RTCEx_Tamper_Sampling_Frequencies_Definitions***
- ***uint32_t RTC_TamperTypeDef::PrechargeDuration***
  Specifies the Precharge Duration . This parameter can be a value of ***RTCEx_Tamper_Pin_Precharge_Duration_Definitions***
- ***uint32_t RTC_TamperTypeDef::TamperPullUp***
  Specifies the Tamper PullUp . This parameter can be a value of ***RTCEx_Tamper_Pull_UP_Definitions***
- ***uint32_t RTC_TamperTypeDef::TimeStampOnTamperDetection***
  Specifies the TimeStampOnTamperDetection. This parameter can be a value of ***RTCEx_Tamper_TimeStampOnTamperDetection_Definitions***

55.2 RTCEx Firmware driver API description

55.2.1 How to use this driver

- Enable the RTC domain access.
- Configure the RTC Prescaler (Asynchronous and Synchronous) and RTC hour format using the HAL_RTC_Init() function.

RTC Wakeup configuration

- To configure the RTC Wakeup Clock source and Counter use the HAL_RTCEx_SetWakeUpTimer() function. You can also configure the RTC Wakeup timer with interrupt mode using the HAL_RTCEx_SetWakeUpTimer_IT() function.
- To read the RTC WakeUp Counter register, use the HAL_RTCEx_GetWakeUpTimer() function.

Outputs configuration

The RTC has 2 different outputs:

- RTC_ALARM: this output is used to manage the RTC Alarm A, Alarm B and WaKeUp signals. To output the selected RTC signal, use the HAL_RTC_Init() function.
- RTC_CALIB: this output is 512Hz signal or 1Hz. To enable the RTC_CALIB, use the HAL_RTCEx_SetCalibrationOutPut() function.
- Two pins can be used as RTC_ALARM or RTC_CALIB (PC13, PB2) managed on the RTC_OR register.
- When the RTC_CALIB or RTC_ALARM output is selected, the RTC_OUT pin is automatically configured in output alternate function.

Smooth digital Calibration configuration

- Configure the RTC Original Digital Calibration Value and the corresponding calibration cycle period (32s,16s and 8s) using the HAL_RTCEx_SetSmoothCalib() function.

TimeStamp configuration

- Enable the RTC TimeStamp using the HAL_RTCEx_SetTimeStamp() function. You can also configure the RTC TimeStamp with interrupt mode using the HAL_RTCEx_SetTimeStamp_IT() function.
- To read the RTC TimeStamp Time and Date register, use the HAL_RTCEx_GetTimeStamp() function.

Internal TimeStamp configuration

- Enable the RTC internal TimeStamp using the HAL_RTCEx_SetInternalTimeStamp() function. User has to check internal timestamp occurrence using __HAL_RTC_INTERNAL_TIMESTAMP_GET_FLAG.
- To read the RTC TimeStamp Time and Date register, use the HAL_RTCEx_GetTimeStamp() function.

Tamper configuration

- Enable the RTC Tamper and configure the Tamper filter count, trigger Edge or Level according to the Tamper filter (if equal to 0 Edge else Level) value, sampling frequency, NoErase, MaskFlag, precharge or discharge and Pull-UP using the HAL_RTCEx_SetTamper() function. You can configure RTC Tamper with interrupt mode using HAL_RTCEx_SetTamper_IT() function.

- The default configuration of the Tamper erases the backup registers. To avoid erase, enable the NoErase field on the RTC_TAMPCR register.

Backup Data Registers configuration

- To write to the RTC Backup Data registers, use the HAL_RTCEx_BKUPWrite() function.
- To read the RTC Backup Data registers, use the HAL_RTCEx_BKUPRead() function.

55.2.2 RTC TimeStamp and Tamper functions

This section provide functions allowing to configure TimeStamp feature

This section contains the following APIs:

- ***HAL_RTCEx_SetTimeStamp()***
- ***HAL_RTCEx_SetTimeStamp_IT()***
- ***HAL_RTCEx_DeactivateTimeStamp()***
- ***HAL_RTCEx_SetInternalTimeStamp()***
- ***HAL_RTCEx_DeactivateInternalTimeStamp()***
- ***HAL_RTCEx_GetTimeStamp()***
- ***HAL_RTCEx_SetTamper()***
- ***HAL_RTCEx_SetTamper_IT()***
- ***HAL_RTCEx_DeactivateTamper()***
- ***HAL_RTCEx_TamperTimeStampIRQHandler()***
- ***HAL_RTCEx_TimeStampEventCallback()***
- ***HAL_RTCEx_Tamper1EventCallback()***
- ***HAL_RTCEx_Tamper2EventCallback()***
- ***HAL_RTCEx_Tamper3EventCallback()***
- ***HAL_RTCEx_PollForTimeStampEvent()***
- ***HAL_RTCEx_PollForTamper1Event()***
- ***HAL_RTCEx_PollForTamper2Event()***
- ***HAL_RTCEx_PollForTamper3Event()***

55.2.3 RTC Wake-up functions

This section provide functions allowing to configure Wake-up feature

This section contains the following APIs:

- ***HAL_RTCEx_SetWakeUpTimer()***
- ***HAL_RTCEx_SetWakeUpTimer_IT()***
- ***HAL_RTCEx_DeactivateWakeUpTimer()***
- ***HAL_RTCEx_GetWakeUpTimer()***
- ***HAL_RTCEx_WakeUpTimerIRQHandler()***
- ***HAL_RTCEx_WakeUpTimerEventCallback()***
- ***HAL_RTCEx_PollForWakeUpTimerEvent()***

55.2.4 Extended Peripheral Control functions

This subsection provides functions allowing to

- Write a data in a specified RTC Backup data register
- Read a data in a specified RTC Backup data register
- Set the Coarse calibration parameters.
- Deactivate the Coarse calibration parameters
- Set the Smooth calibration parameters.

- Configure the Synchronization Shift Control Settings.
- Configure the Calibration Pinout (RTC_CALIB) Selection (1Hz or 512Hz).
- Deactivate the Calibration Pinout (RTC_CALIB) Selection (1Hz or 512Hz).
- Enable the RTC reference clock detection.
- Disable the RTC reference clock detection.
- Enable the Bypass Shadow feature.
- Disable the Bypass Shadow feature.

This section contains the following APIs:

- ***HAL_RTCEx_BKUPWrite()***
- ***HAL_RTCEx_BKUPRead()***
- ***HAL_RTCEx_SetSmoothCalib()***
- ***HAL_RTCEx_SetSynchroShift()***
- ***HAL_RTCEx_SetCalibrationOutPut()***
- ***HAL_RTCEx_DeactivateCalibrationOutPut()***
- ***HAL_RTCEx_SetRefClock()***
- ***HAL_RTCEx_DeactivateRefClock()***
- ***HAL_RTCEx_EnableBypassShadow()***
- ***HAL_RTCEx_DisableBypassShadow()***

55.2.5 Extended features functions

This section provides functions allowing to:

- RTC Alarm B callback
- RTC Poll for Alarm B request

This section contains the following APIs:

- ***HAL_RTCEx_AlarmBEventCallback()***
- ***HAL_RTCEx_PollForAlarmBEvent()***

55.2.6 Detailed description of functions

HAL_RTCEx_SetTimeStamp

Function name
HAL_StatusTypeDef HAL_RTCEx_SetTimeStamp (RTC_HandleTypeDef * hrtc, uint32_t TimeStampEdge, uint32_t RTC_TimeStampPin)

Function description
Set TimeStamp.

Parameters
- **hrtc:** RTC handle
- **TimeStampEdge:** Specifies the pin edge on which the TimeStamp is activated. This parameter can be one of the following values:
  - RTC_TIMESTAMPEDGE_RISING: the Time stamp event occurs on the rising edge of the related pin.
  - RTC_TIMESTAMPEDGE_FALLING: the Time stamp event occurs on the falling edge of the related pin.
- **RTC_TimeStampPin:** specifies the RTC TimeStamp Pin. This parameter can be one of the following values:
  - RTC_TIMESTAMPPIN_DEFAULT: PC13 is selected as RTC TimeStamp Pin. The RTC TimeStamp Pin is per default PC13, but for reasons of compatibility, this parameter is required.

Return values
- **HAL:** status

Notes
- This API must be called before enabling the TimeStamp feature.

HAL_RTCEx_SetTimeStamp_IT

Function name
HAL_StatusTypeDef HAL_RTCEx_SetTimeStamp_IT (RTC_HandleTypeDef * hrtc, uint32_t TimeStampEdge, uint32_t RTC_TimeStampPin)

Function description
Set TimeStamp with Interrupt.

Parameters
- **hrtc:** RTC handle
- **TimeStampEdge:** Specifies the pin edge on which the TimeStamp is activated. This parameter can be one of the following values:
  - RTC_TIMESTAMPEDGE_RISING: the Time stamp event occurs on the rising edge of the related pin.
  - RTC_TIMESTAMPEDGE_FALLING: the Time stamp event occurs on the falling edge of the related pin.
- **RTC_TimeStampPin:** Specifies the RTC TimeStamp Pin. This parameter can be one of the following values:
  - RTC_TIMESTAMPPIN_DEFAULT: PC13 is selected as RTC TimeStamp Pin. The RTC TimeStamp Pin is per default PC13, but for reasons of compatibility, this parameter is required.

Return values
- **HAL:** status

Notes
- This API must be called before enabling the TimeStamp feature.

HAL_RTCEx_DeactivateTimeStamp

Function name
HAL_StatusTypeDef HAL_RTCEx_DeactivateTimeStamp (RTC_HandleTypeDef * hrtc)

Function description
Deactivate TimeStamp.

Parameters
- **hrtc:** RTC handle

Return values
- **HAL:** status

HAL_RTCEx_SetInternalTimeStamp

Function name
HAL_StatusTypeDef HAL_RTCEx_SetInternalTimeStamp (RTC_HandleTypeDef * hrtc)

Function description
Set Internal TimeStamp.

Parameters
- **hrtc:** pointer to a RTC_HandleTypeDef structure that contains the configuration information for RTC.

Return values
- **HAL:** status

Notes
- This API must be called before enabling the internal TimeStamp feature.

HAL_RTCEx_DeactivateInternalTimeStamp

Function name
HAL_StatusTypeDef HAL_RTCEx_DeactivateInternalTimeStamp (RTC_HandleTypeDef * hrtc)

Function description
Deactivate Internal TimeStamp.

Parameters
- **hrtc:** pointer to a RTC_HandleTypeDef structure that contains the configuration information for RTC.

Return values
- **HAL:** status

HAL_RTCEx_GetTimeStamp

Function name
HAL_StatusTypeDef HAL_RTCEx_GetTimeStamp (RTC_HandleTypeDef * hrtc, RTC_TimeTypeDef * sTimeStamp, RTC_DateTypeDef * sTimeStampDate, uint32_t Format)

Function description
Get the RTC TimeStamp value.

Parameters
- **hrtc:** RTC handle
- **sTimeStamp:** Pointer to Time structure
- **sTimeStampDate:** Pointer to Date structure
- **Format:** specifies the format of the entered parameters. This parameter can be one of the following values:
  - RTC_FORMAT_BIN: Binary data format
  - RTC_FORMAT_BCD: BCD data format

Return values
- **HAL:** status

HAL_RTCEx_SetTamper

Function name
HAL_StatusTypeDef HAL_RTCEx_SetTamper (RTC_HandleTypeDef * hrtc, RTC_TamperTypeDef * sTamper)

Function description
Set Tamper.

Parameters
- **hrtc:** RTC handle
- **sTamper:** Pointer to Tamper Structure.

Return values
- **HAL:** status

Notes
- By calling this API we disable the tamper interrupt for all tampers.

HAL_RTCEx_SetTamper_IT

Function name
HAL_StatusTypeDef HAL_RTCEx_SetTamper_IT (RTC_HandleTypeDef * hrtc, RTC_TamperTypeDef * sTamper)

Function description
Set Tamper with interrupt.

Parameters
- **hrtc:** RTC handle
- **sTamper:** Pointer to RTC Tamper.

Return values
- **HAL:** status

Notes
- By calling this API we force the tamper interrupt for all

tampers.

HAL_RTCEx_DeactivateTamper

Function name	**HAL_StatusTypeDef HAL_RTCEx_DeactivateTamper (RTC_HandleTypeDef * hrtc, uint32_t Tamper)**
Function description	Deactivate Tamper.
Parameters	• **hrtc:** RTC handle • **Tamper:** Selected tamper pin. This parameter can be any combination of RTC_TAMPER_1, RTC_TAMPER_2 and RTC_TAMPER_3.
Return values	• **HAL:** status

HAL_RTCEx_TamperTimeStampIRQHandler

Function name	**void HAL_RTCEx_TamperTimeStampIRQHandler (RTC_HandleTypeDef * hrtc)**
Function description	Handle TimeStamp interrupt request.
Parameters	• **hrtc:** RTC handle
Return values	• **None:**

HAL_RTCEx_Tamper1EventCallback

Function name	**void HAL_RTCEx_Tamper1EventCallback (RTC_HandleTypeDef * hrtc)**
Function description	Tamper 1 callback.
Parameters	• **hrtc:** RTC handle
Return values	• **None:**

HAL_RTCEx_Tamper2EventCallback

Function name	**void HAL_RTCEx_Tamper2EventCallback (RTC_HandleTypeDef * hrtc)**
Function description	Tamper 2 callback.
Parameters	• **hrtc:** RTC handle
Return values	• **None:**

HAL_RTCEx_Tamper3EventCallback

Function name	**void HAL_RTCEx_Tamper3EventCallback (RTC_HandleTypeDef * hrtc)**
Function description	Tamper 3 callback.
Parameters	• **hrtc:** RTC handle
Return values	• **None:**

HAL_RTCEx_TimeStampEventCallback

Function name **void HAL_RTCEx_TimeStampEventCallback (RTC_HandleTypeDef * hrtc)**

Function description TimeStamp callback.

Parameters
- **hrtc:** RTC handle

Return values
- **None:**

HAL_RTCEx_PollForTimeStampEvent

Function name **HAL_StatusTypeDef HAL_RTCEx_PollForTimeStampEvent (RTC_HandleTypeDef * hrtc, uint32_t Timeout)**

Function description Handle TimeStamp polling request.

Parameters
- **hrtc:** RTC handle
- **Timeout:** Timeout duration

Return values
- **HAL:** status

HAL_RTCEx_PollForTamper1Event

Function name **HAL_StatusTypeDef HAL_RTCEx_PollForTamper1Event (RTC_HandleTypeDef * hrtc, uint32_t Timeout)**

Function description Handle Tamper 1 Polling.

Parameters
- **hrtc:** RTC handle
- **Timeout:** Timeout duration

Return values
- **HAL:** status

HAL_RTCEx_PollForTamper2Event

Function name **HAL_StatusTypeDef HAL_RTCEx_PollForTamper2Event (RTC_HandleTypeDef * hrtc, uint32_t Timeout)**

Function description Handle Tamper 2 Polling.

Parameters
- **hrtc:** RTC handle
- **Timeout:** Timeout duration

Return values
- **HAL:** status

HAL_RTCEx_PollForTamper3Event

Function name **HAL_StatusTypeDef HAL_RTCEx_PollForTamper3Event (RTC_HandleTypeDef * hrtc, uint32_t Timeout)**

Function description Handle Tamper 3 Polling.

Parameters
- **hrtc:** RTC handle
- **Timeout:** Timeout duration

Return values
- **HAL:** status

HAL_RTCEx_SetWakeUpTimer

Function name	**HAL_StatusTypeDef HAL_RTCEx_SetWakeUpTimer (RTC_HandleTypeDef * hrtc, uint32_t WakeUpCounter, uint32_t WakeUpClock)**
Function description	Set wake up timer.
Parameters	• **hrtc:** RTC handle • **WakeUpCounter:** Wake up counter • **WakeUpClock:** Wake up clock
Return values	• **HAL:** status

HAL_RTCEx_SetWakeUpTimer_IT

Function name	**HAL_StatusTypeDef HAL_RTCEx_SetWakeUpTimer_IT (RTC_HandleTypeDef * hrtc, uint32_t WakeUpCounter, uint32_t WakeUpClock)**
Function description	Set wake up timer with interrupt.
Parameters	• **hrtc:** RTC handle • **WakeUpCounter:** Wake up counter • **WakeUpClock:** Wake up clock
Return values	• **HAL:** status

HAL_RTCEx_DeactivateWakeUpTimer

Function name	**uint32_t HAL_RTCEx_DeactivateWakeUpTimer (RTC_HandleTypeDef * hrtc)**
Function description	Deactivate wake up timer counter.
Parameters	• **hrtc:** RTC handle
Return values	• **HAL:** status

HAL_RTCEx_GetWakeUpTimer

Function name	**uint32_t HAL_RTCEx_GetWakeUpTimer (RTC_HandleTypeDef * hrtc)**
Function description	Get wake up timer counter.
Parameters	• **hrtc:** RTC handle
Return values	• **Counter:** value

HAL_RTCEx_WakeUpTimerIRQHandler

Function name	**void HAL_RTCEx_WakeUpTimerIRQHandler (RTC_HandleTypeDef * hrtc)**
Function description	Handle Wake Up Timer interrupt request.
Parameters	• **hrtc:** RTC handle
Return values	• **None:**

HAL_RTCEx_WakeUpTimerEventCallback

Function name **void HAL_RTCEx_WakeUpTimerEventCallback (RTC_HandleTypeDef * hrtc)**

Function description Wake Up Timer callback.

Parameters
- **hrtc:** RTC handle

Return values
- **None:**

HAL_RTCEx_PollForWakeUpTimerEvent

Function name **HAL_StatusTypeDef HAL_RTCEx_PollForWakeUpTimerEvent (RTC_HandleTypeDef * hrtc, uint32_t Timeout)**

Function description Handle Wake Up Timer Polling.

Parameters
- **hrtc:** RTC handle
- **Timeout:** Timeout duration

Return values
- **HAL:** status

HAL_RTCEx_BKUPWrite

Function name **void HAL_RTCEx_BKUPWrite (RTC_HandleTypeDef * hrtc, uint32_t BackupRegister, uint32_t Data)**

Function description Write a data in a specified RTC Backup data register.

Parameters
- **hrtc:** RTC handle
- **BackupRegister:** RTC Backup data Register number. This parameter can be: RTC_BKP_DRx where x can be from 0 to 19 to specify the register.
- **Data:** Data to be written in the specified RTC Backup data register.

Return values
- **None:**

HAL_RTCEx_BKUPRead

Function name **uint32_t HAL_RTCEx_BKUPRead (RTC_HandleTypeDef * hrtc, uint32_t BackupRegister)**

Function description Read data from the specified RTC Backup data Register.

Parameters
- **hrtc:** RTC handle
- **BackupRegister:** RTC Backup data Register number. This parameter can be: RTC_BKP_DRx where x can be from 0 to 19 to specify the register.

Return values
- **Read:** value

HAL_RTCEx_SetSmoothCalib

Function name **HAL_StatusTypeDef HAL_RTCEx_SetSmoothCalib (RTC_HandleTypeDef * hrtc, uint32_t SmoothCalibPeriod, uint32_t SmoothCalibPlusPulses, uint32_t SmoothCalibMinusPulsesValue)**

Function description: Set the Smooth calibration parameters.

Parameters:
- **hrtc:** RTC handle
- **SmoothCalibPeriod:** Select the Smooth Calibration Period. This parameter can be can be one of the following values:
  - RTC_SMOOTHCALIB_PERIOD_32SEC: The smooth calibration period is 32s.
  - RTC_SMOOTHCALIB_PERIOD_16SEC: The smooth calibration period is 16s.
  - RTC_SMOOTHCALIB_PERIOD_8SEC: The smooth calibration period is 8s.
- **SmoothCalibPlusPulses:** Select to Set or reset the CALP bit. This parameter can be one of the following values:
  - RTC_SMOOTHCALIB_PLUSPULSES_SET: Add one RTCCLK pulse every 2*11 pulses.
  - RTC_SMOOTHCALIB_PLUSPULSES_RESET: No RTCCLK pulses are added.
- **SmoothCalibMinusPulsesValue:** Select the value of CALM[8:0] bits. This parameter can be one any value from 0 to 0x000001FF.

Return values:
- **HAL:** status

Notes:
- To deactivate the smooth calibration, the field SmoothCalibPlusPulses must be equal to SMOOTHCALIB_PLUSPULSES_RESET and the field SmoothCalibMinusPulsesValue must be equal to 0.

HAL_RTCEx_SetSynchroShift

Function name: **HAL_StatusTypeDef HAL_RTCEx_SetSynchroShift (RTC_HandleTypeDef * hrtc, uint32_t ShiftAdd1S, uint32_t ShiftSubFS)**

Function description: Configure the Synchronization Shift Control Settings.

Parameters:
- **hrtc:** RTC handle
- **ShiftAdd1S:** Select to add or not 1 second to the time calendar. This parameter can be one of the following values:
  - RTC_SHIFTADD1S_SET: Add one second to the clock calendar.
  - RTC_SHIFTADD1S_RESET: No effect.
- **ShiftSubFS:** Select the number of Second Fractions to substitute. This parameter can be one any value from 0 to 0x7FFF.

Return values:
- **HAL:** status

Notes:
- When REFCKON is set, firmware must not write to Shift control register.

HAL_RTCEx_SetCalibrationOutPut

Function name: **HAL_StatusTypeDef HAL_RTCEx_SetCalibrationOutPut (RTC_HandleTypeDef * hrtc, uint32_t CalibOutput)**

Function description: Configure the Calibration Pinout (RTC_CALIB) Selection (1Hz or

512Hz).

Parameters
- **hrtc:** RTC handle
- **CalibOutput:** : Select the Calibration output Selection . This parameter can be one of the following values:
  - RTC_CALIBOUTPUT_512HZ: A signal has a regular waveform at 512Hz.
  - RTC_CALIBOUTPUT_1HZ: A signal has a regular waveform at 1Hz.

Return values
- **HAL:** status

HAL_RTCEx_DeactivateCalibrationOutPut

Function name **HAL_StatusTypeDef HAL_RTCEx_DeactivateCalibrationOutPut (RTC_HandleTypeDef * hrtc)**

Function description Deactivate the Calibration Pinout (RTC_CALIB) Selection (1Hz or 512Hz).

Parameters
- **hrtc:** RTC handle

Return values
- **HAL:** status

HAL_RTCEx_SetRefClock

Function name **HAL_StatusTypeDef HAL_RTCEx_SetRefClock (RTC_HandleTypeDef * hrtc)**

Function description Enable the RTC reference clock detection.

Parameters
- **hrtc:** RTC handle

Return values
- **HAL:** status

HAL_RTCEx_DeactivateRefClock

Function name **HAL_StatusTypeDef HAL_RTCEx_DeactivateRefClock (RTC_HandleTypeDef * hrtc)**

Function description Disable the RTC reference clock detection.

Parameters
- **hrtc:** RTC handle

Return values
- **HAL:** status

HAL_RTCEx_EnableBypassShadow

Function name **HAL_StatusTypeDef HAL_RTCEx_EnableBypassShadow (RTC_HandleTypeDef * hrtc)**

Function description Enable the Bypass Shadow feature.

Parameters
- **hrtc:** RTC handle

Return values
- **HAL:** status

Notes
- When the Bypass Shadow is enabled the calendar value are taken directly from the Calendar counter.

HAL_RTCEx_DisableBypassShadow

Function name	**HAL_StatusTypeDef HAL_RTCEx_DisableBypassShadow (RTC_HandleTypeDef * hrtc)**
Function description	Disable the Bypass Shadow feature.
Parameters	• **hrtc:** RTC handle
Return values	• **HAL:** status
Notes	• When the Bypass Shadow is enabled the calendar value are taken directly from the Calendar counter.

HAL_RTCEx_AlarmBEventCallback

Function name	**void HAL_RTCEx_AlarmBEventCallback (RTC_HandleTypeDef * hrtc)**
Function description	Alarm B callback.
Parameters	• **hrtc:** RTC handle
Return values	• **None:**

HAL_RTCEx_PollForAlarmBEvent

Function name	**HAL_StatusTypeDef HAL_RTCEx_PollForAlarmBEvent (RTC_HandleTypeDef * hrtc, uint32_t Timeout)**
Function description	Handle Alarm B Polling request.
Parameters	• **hrtc:** RTC handle • **Timeout:** Timeout duration
Return values	• **HAL:** status

55.3 RTCEx Firmware driver defines

55.3.1 RTCEx

RTC Add 1 Second Parameter Definitions

RTC_SHIFTADD1S_RESET

RTC_SHIFTADD1S_SET

RTC Backup Registers Definitions

RTC_BKP_DR0

RTC_BKP_DR1

RTC_BKP_DR2

RTC_BKP_DR3

RTC_BKP_DR4

RTC_BKP_DR5

RTC_BKP_DR6

RTC_BKP_DR7

RTC_BKP_DR8

RTC_BKP_DR9

RTC_BKP_DR10

RTC_BKP_DR11

RTC_BKP_DR12

RTC_BKP_DR13

RTC_BKP_DR14

RTC_BKP_DR15

RTC_BKP_DR16

RTC_BKP_DR17

RTC_BKP_DR18

RTC_BKP_DR19

RTC_BKP_DR20

RTC_BKP_DR21

RTC_BKP_DR22

RTC_BKP_DR23

RTC_BKP_DR24

RTC_BKP_DR25

RTC_BKP_DR26

RTC_BKP_DR27

RTC_BKP_DR28

RTC_BKP_DR29

RTC_BKP_DR30

RTC_BKP_DR31

RTC Calib Output Selection Definitions

RTC_CALIBOUTPUT_512HZ

RTC_CALIBOUTPUT_1HZ

RTCEx Exported Macros

__HAL_RTC_WAKEUPTIMER_ENABLE

Description:

- Enable the RTC WakeUp Timer peripheral.

Parameters:

- __HANDLE__: specifies the RTC handle.

Return value:

- None

__HAL_RTC_WAKEUPTIMER_DISABLE

Description:

- Disable the RTC WakeUp Timer peripheral.

Parameters:

- __HANDLE__: specifies the RTC handle.

Return value:

- None

__HAL_RTC_WAKEUPTIMER_ENABLE_IT

Description:

- Enable the RTC WakeUpTimer interrupt.

Parameters:

- __HANDLE__: specifies the RTC handle.
- __INTERRUPT__: specifies the RTC WakeUpTimer interrupt sources to be enabled. This parameter can be:
  - RTC_IT_WUT: WakeUpTimer interrupt

Return value:

- None

__HAL_RTC_WAKEUPTIMER_DISABLE_IT

Description:

- Disable the RTC WakeUpTimer interrupt.

Parameters:

- __HANDLE__: specifies the RTC handle.
- __INTERRUPT__: specifies the RTC WakeUpTimer interrupt sources to be disabled. This parameter can be:
  - RTC_IT_WUT: WakeUpTimer interrupt

Return value:

- None

__HAL_RTC_WAKEUPTIMER_GET_IT

Description:

- Check whether the specified RTC WakeUpTimer interrupt has occurred or not.

Parameters:

- __HANDLE__: specifies the RTC handle.
- __INTERRUPT__: specifies the RTC WakeUpTimer interrupt

sources to check. This parameter can be:
– RTC_IT_WUT: WakeUpTimer interrupt

Return value:

- None

__HAL_RTC_WAKEUPTIMER_GET_IT_SOURCE

Description:

- Check whether the specified RTC Wake Up timer interrupt is enabled or not.

Parameters:

- __HANDLE__: specifies the RTC handle.
- __INTERRUPT__: specifies the RTC Wake Up timer interrupt sources to check. This parameter can be:
  – RTC_IT_WUT: WakeUpTimer interrupt

Return value:

- None

__HAL_RTC_WAKEUPTIMER_GET_FLAG

Description:

- Get the selected RTC WakeUpTimer's flag status.

Parameters:

- __HANDLE__: specifies the RTC handle.
- __FLAG__: specifies the RTC WakeUpTimer Flag is pending or not. This parameter can be:
  – RTC_FLAG_WUTF
  – RTC_FLAG_WUTWF

Return value:

- None

__HAL_RTC_WAKEUPTIMER_CLEAR_FLAG

Description:

- Clear the RTC Wake Up timer's pending flags.

Parameters:

- __HANDLE__: specifies the RTC handle.
- __FLAG__: specifies the RTC WakeUpTimer Flag to clear. This parameter can be:
  – RTC_FLAG_WUTF

Return value:

- None

__HAL_RTC_TAMPER1_ENABLE

Description:

- Enable the RTC Tamper1 input detection.

Parameters:

- __HANDLE__: specifies the RTC handle.

Return value:

- None

__HAL_RTC_TAMPER1_DISABLE

Description:

- Disable the RTC Tamper1 input detection.

Parameters:

- __HANDLE__: specifies the RTC handle.

Return value:

- None

__HAL_RTC_TAMPER2_ENABLE

Description:

- Enable the RTC Tamper2 input detection.

Parameters:

- __HANDLE__: specifies the RTC handle.

Return value:

- None

__HAL_RTC_TAMPER2_DISABLE

Description:

- Disable the RTC Tamper2 input detection.

Parameters:

- __HANDLE__: specifies the RTC handle.

Return value:

- None

__HAL_RTC_TAMPER3_ENABLE

Description:

- Enable the RTC Tamper3 input detection.

Parameters:

- __HANDLE__: specifies the

RTC handle.

Return value:

- None

__HAL_RTC_TAMPER3_DISABLE

Description:

- Disable the RTC Tamper3 input detection.

Parameters:

- __HANDLE__: specifies the RTC handle.

Return value:

- None

__HAL_RTC_TAMPER_ENABLE_IT

Description:

- Enable the RTC Tamper interrupt.

Parameters:

- __HANDLE__: specifies the RTC handle.
- __INTERRUPT__: specifies the RTC Tamper interrupt sources to be enabled. This parameter can be any combination of the following values:
  - RTC_IT_TAMP: All tampers interrupts
  - RTC_IT_TAMP1: Tamper1 interrupt
  - RTC_IT_TAMP2: Tamper2 interrupt
  - RTC_IT_TAMP3: Tamper3 interrupt

Return value:

- None

__HAL_RTC_TAMPER_DISABLE_IT

Description:

- Disable the RTC Tamper interrupt.

Parameters:

- __HANDLE__: specifies the RTC handle.
- __INTERRUPT__: specifies the RTC Tamper interrupt sources to be disabled. This parameter can be any combination of the following values:
  - RTC_IT_TAMP: All tampers interrupts

– RTC_IT_TAMP1: Tamper1 interrupt
– RTC_IT_TAMP2: Tamper2 interrupt
– RTC_IT_TAMP3: Tamper3 interrupt

Return value:

- None

__HAL_RTC_TAMPER_GET_IT

Description:

- Check whether the specified RTC Tamper interrupt has occurred or not.

Parameters:

- __HANDLE__: specifies the RTC handle.
- __INTERRUPT__: specifies the RTC Tamper interrupt to check. This parameter can be:
  – RTC_IT_TAMP1: Tamper1 interrupt
  – RTC_IT_TAMP2: Tamper2 interrupt
  – RTC_IT_TAMP3: Tamper3 interrupt

Return value:

- None

__HAL_RTC_TAMPER_GET_IT_SOURCE

Description:

- Check whether the specified RTC Tamper interrupt is enabled or not.

Parameters:

- __HANDLE__: specifies the RTC handle.
- __INTERRUPT__: specifies the RTC Tamper interrupt source to check. This parameter can be:
  – RTC_IT_TAMP: All tampers interrupts
  – RTC_IT_TAMP1: Tamper1 interrupt
  – RTC_IT_TAMP2: Tamper2 interrupt
  – RTC_IT_TAMP3: Tamper3 interrupt

Return value:

- None

__HAL_RTC_TAMPER_GET_FLAG

Description:

- Get the selected RTC Tamper's flag status.

Parameters:

- __HANDLE__: specifies the RTC handle.
- __FLAG__: specifies the RTC Tamper Flag is pending or not. This parameter can be:
  - RTC_FLAG_TAMP1F: Tamper1 flag
  - RTC_FLAG_TAMP2F: Tamper2 flag
  - RTC_FLAG_TAMP3F: Tamper3 flag

Return value:

- None

__HAL_RTC_TAMPER_CLEAR_FLAG

Description:

- Clear the RTC Tamper's pending flags.

Parameters:

- __HANDLE__: specifies the RTC handle.
- __FLAG__: specifies the RTC Tamper Flag sources to clear. This parameter can be:
  - RTC_FLAG_TAMP1F: Tamper1 flag
  - RTC_FLAG_TAMP2F: Tamper2 flag
  - RTC_FLAG_TAMP3F: Tamper3 flag

Return value:

- None

__HAL_RTC_TIMESTAMP_ENABLE

Description:

- Enable the RTC TimeStamp peripheral.

Parameters:

- __HANDLE__: specifies the RTC handle.

Return value:

- None

__HAL_RTC_TIMESTAMP_DISABLE

Description:

- Disable the RTC TimeStamp

peripheral.

Parameters:

- __HANDLE__: specifies the RTC handle.

Return value:

- None

__HAL_RTC_TIMESTAMP_ENABLE_IT

Description:

- Enable the RTC TimeStamp interrupt.

Parameters:

- __HANDLE__: specifies the RTC handle.
- __INTERRUPT__: specifies the RTC TimeStamp interrupt source to be enabled. This parameter can be:
  - RTC_IT_TS: TimeStamp interrupt

Return value:

- None

__HAL_RTC_TIMESTAMP_DISABLE_IT

Description:

- Disable the RTC TimeStamp interrupt.

Parameters:

- __HANDLE__: specifies the RTC handle.
- __INTERRUPT__: specifies the RTC TimeStamp interrupt source to be disabled. This parameter can be:
  - RTC_IT_TS: TimeStamp interrupt

Return value:

- None

__HAL_RTC_TIMESTAMP_GET_IT

Description:

- Check whether the specified RTC TimeStamp interrupt has occurred or not.

Parameters:

- __HANDLE__: specifies the RTC handle.
- __INTERRUPT__: specifies the RTC TimeStamp interrupt source to check. This parameter

can be:
  - RTC_IT_TS: TimeStamp interrupt

Return value:

- None

__HAL_RTC_TIMESTAMP_GET_IT_SOURCE

Description:

- Check whether the specified RTC Time Stamp interrupt is enabled or not.

Parameters:

- __HANDLE__: specifies the RTC handle.
- __INTERRUPT__: specifies the RTC Time Stamp interrupt source to check. This parameter can be:
  - RTC_IT_TS: TimeStamp interrupt

Return value:

- None

__HAL_RTC_TIMESTAMP_GET_FLAG

Description:

- Get the selected RTC TimeStamp's flag status.

Parameters:

- __HANDLE__: specifies the RTC handle.
- __FLAG__: specifies the RTC TimeStamp Flag is pending or not. This parameter can be:
  - RTC_FLAG_TSF
  - RTC_FLAG_TSOVF

Return value:

- None

__HAL_RTC_TIMESTAMP_CLEAR_FLAG

Description:

- Clear the RTC Time Stamp's pending flags.

Parameters:

- __HANDLE__: specifies the RTC handle.
- __FLAG__: specifies the RTC Alarm Flag sources to clear. This parameter can be:
  - RTC_FLAG_TSF
  - RTC_FLAG_TSOVF

Return value:

- None

__HAL_RTC_INTERNAL_TIMESTAMP_ENABLE

Description:

- Enable the RTC internal TimeStamp peripheral.

Parameters:

- __HANDLE__: specifies the RTC handle.

Return value:

- None

__HAL_RTC_INTERNAL_TIMESTAMP_DISABLE

Description:

- Disable the RTC internal TimeStamp peripheral.

Parameters:

- __HANDLE__: specifies the RTC handle.

Return value:

- None

__HAL_RTC_INTERNAL_TIMESTAMP_GET_FLAG

Description:

- Get the selected RTC Internal Time Stamp's flag status.

Parameters:

- __HANDLE__: specifies the RTC handle.
- __FLAG__: specifies the RTC Internal Time Stamp Flag is pending or not. This parameter can be:
  – RTC_FLAG_ITSF

Return value:

- None

__HAL_RTC_INTERNAL_TIMESTAMP_CLEAR_FLAG

Description:

- Clear the RTC Internal Time Stamp's pending flags.

Parameters:

- __HANDLE__: specifies the RTC handle.
- __FLAG__: specifies the RTC Internal Time Stamp Flag source to clear. This parameter can be:
  – RTC_FLAG_ITSF

Return value:

- None

__HAL_RTC_CALIBRATION_OUTPUT_ENABLE

Description:

- Enable the RTC calibration output.

Parameters:

- __HANDLE__: specifies the RTC handle.

Return value:

- None

__HAL_RTC_CALIBRATION_OUTPUT_DISABLE

Description:

- Disable the calibration output.

Parameters:

- __HANDLE__: specifies the RTC handle.

Return value:

- None

__HAL_RTC_CLOCKREF_DETECTION_ENABLE

Description:

- Enable the clock reference detection.

Parameters:

- __HANDLE__: specifies the RTC handle.

Return value:

- None

__HAL_RTC_CLOCKREF_DETECTION_DISABLE

Description:

- Disable the clock reference detection.

Parameters:

- __HANDLE__: specifies the RTC handle.

Return value:

- None

__HAL_RTC_SHIFT_GET_FLAG

Description:

- Get the selected RTC shift operation's flag status.

Parameters:

- __HANDLE__: specifies the RTC handle.

- __FLAG__: specifies the RTC shift operation Flag is pending or not. This parameter can be:
  – RTC_FLAG_SHPF

Return value:

- None

__HAL_RTC_WAKEUPTIMER_EXTI_ENABLE_IT

Description:

- Enable interrupt on the RTC WakeUp Timer associated Exti line.

Return value:

- None

__HAL_RTC_WAKEUPTIMER_EXTI_DISABLE_IT

Description:

- Disable interrupt on the RTC WakeUp Timer associated Exti line.

Return value:

- None

__HAL_RTC_WAKEUPTIMER_EXTI_ENABLE_EVENT

Description:

- Enable event on the RTC WakeUp Timer associated Exti line.

Return value:

- None

__HAL_RTC_WAKEUPTIMER_EXTI_DISABLE_EVENT

Description:

- Disable event on the RTC WakeUp Timer associated Exti line.

Return value:

- None

__HAL_RTC_WAKEUPTIMER_EXTI_ENABLE_FALLING_EDGE

Description:

- Enable falling edge trigger on the RTC WakeUp Timer associated Exti line.

Return value:

- None

__HAL_RTC_WAKEUPTIMER_EXTI_DISABLE_FALLING_EDGE

Description:

- Disable falling edge trigger on the RTC WakeUp Timer associated Exti line.

Return value:

- None

__HAL_RTC_WAKEUPTIMER_EXTI_ENABLE_RISING_EDGE

Description:

- Enable rising edge trigger on the RTC WakeUp Timer associated Exti line.

Return value:

- None

__HAL_RTC_WAKEUPTIMER_EXTI_DISABLE_RISING_EDGE

Description:

- Disable rising edge trigger on the RTC WakeUp Timer associated Exti line.

Return value:

- None

__HAL_RTC_WAKEUPTIMER_EXTI_ENABLE_RISING_FALLING_EDGE

Description:

- Enable rising & falling edge trigger on the RTC WakeUp Timer associated Exti line.

Return value:

- None

__HAL_RTC_WAKEUPTIMER_EXTI_DISABLE_RISING_FALLING_EDGE

Description:

- Disable rising & falling edge trigger on the RTC WakeUp Timer associated Exti line.

Return value:

- None

__HAL_RTC_WAKEUPTIMER_EXTI_GET_FLAG

Description:

- Check whether the RTC WakeUp Timer associated Exti line interrupt flag is set or not.

Return value:

- Line: Status.

__HAL_RTC_WAKEUPTIMER_EXTI_CLEAR_FLAG

Description:

- Clear the RTC WakeUp Timer associated Exti line flag.

Return value:

- None

__HAL_RTC_WAKEUPTIMER_EXTI_GENERATE_SWIT

Description:

- Generate a Software interrupt on the RTC WakeUp Timer associated Exti line.

Return value:

- None

__HAL_RTC_TAMPER_TIMESTAMP_EXTI_ENABLE_IT

Description:

- Enable interrupt on the RTC Tamper and Timestamp associated Exti line.

Return value:

- None

__HAL_RTC_TAMPER_TIMESTAMP_EXTI_DISABLE_IT

Description:

- Disable interrupt on the RTC Tamper and Timestamp associated Exti line.

Return value:

- None

__HAL_RTC_TAMPER_TIMESTAMP_EXTI_ENABLE_EVENT

Description:

- Enable event on the RTC Tamper and Timestamp associated Exti line.

Return value:

- None

__HAL_RTC_TAMPER_TIMESTAMP_EXTI_DISABLE_EVENT

Description:

- Disable event on the RTC Tamper and Timestamp associated Exti line.

Return value:

- None

__HAL_RTC_TAMPER_TIMESTAMP_EXTI_ENABLE_FALLING_EDGE

Description:

- Enable falling edge trigger on the RTC Tamper and Timestamp associated Exti line.

Return value:

- None

__HAL_RTC_TAMPER_TIMESTAMP_EXTI_DISABLE_FALLING_EDGE

Description:

- Disable falling edge trigger on the RTC Tamper and Timestamp associated Exti line.

Return value:

- None

__HAL_RTC_TAMPER_TIMESTAMP_EXTI_ENABLE_RISING_EDGE

Description:

- Enable rising edge trigger on the RTC Tamper and

	Timestamp associated Exti line. **Return value:** • None
__HAL_RTC_TAMPER_TIMESTAMP_EXTI_DISABLE_RISING_EDGE	**Description:** • Disable rising edge trigger on the RTC Tamper and Timestamp associated Exti line. **Return value:** • None
__HAL_RTC_TAMPER_TIMESTAMP_EXTI_ENABLE_RISING_FALLING_EDGE	**Description:** • Enable rising & falling edge trigger on the RTC Tamper and Timestamp associated Exti line. **Return value:** • None
__HAL_RTC_TAMPER_TIMESTAMP_EXTI_DISABLE_RISING_FALLING_EDGE	**Description:** • Disable rising & falling edge trigger on the RTC Tamper and Timestamp associated Exti line. **Return value:** • None
__HAL_RTC_TAMPER_TIMESTAMP_EXTI_GET_FLAG	**Description:** • Check whether the RTC Tamper and Timestamp associated Exti line interrupt flag is set or not. **Return value:** • Line: Status.
__HAL_RTC_TAMPER_TIMESTAMP_EXTI_CLEAR_FLAG	**Description:** • Clear the RTC Tamper and Timestamp associated Exti line flag. **Return value:** • None
__HAL_RTC_TAMPER_TIMESTAMP_EXTI_GENERATE_SWIT	**Description:** • Generate a Software interrupt on the RTC Tamper and Timestamp associated Exti line. **Return value:** • None

Private macros to check input parameters

IS_RTC_OUTPUT

IS_RTC_BKP

IS_TIMESTAMP_EDGE

IS_RTC_TAMPER

IS_RTC_TAMPER_INTERRUPT

IS_RTC_TIMESTAMP_PIN

IS_RTC_TAMPER_TRIGGER

IS_RTC_TAMPER_ERASE_MODE

IS_RTC_TAMPER_MASKFLAG_STATE

IS_RTC_TAMPER_FILTER

IS_RTC_TAMPER_SAMPLING_FREQ

IS_RTC_TAMPER_PRECHARGE_DURATION

IS_RTC_TAMPER_TIMESTAMPONTAMPER_DETECTION

IS_RTC_TAMPER_PULLUP_STATE

IS_RTC_WAKEUP_CLOCK

IS_RTC_WAKEUP_COUNTER

IS_RTC_SMOOTH_CALIB_PERIOD

IS_RTC_SMOOTH_CALIB_PLUS

IS_RTC_SMOOTH_CALIB_MINUS

IS_RTC_SHIFT_ADD1S

IS_RTC_SHIFT_SUBFS

IS_RTC_CALIB_OUTPUT

RTC Output Selection Definitions

RTC_OUTPUT_DISABLE

RTC_OUTPUT_ALARMA

RTC_OUTPUT_ALARMB

RTC_OUTPUT_WAKEUP

RTC Smooth Calib Period Definitions

RTC_SMOOTHCALIB_PERIOD_32SEC	If RTCCLK = 32768 Hz, Smooth calibration period is 32s, else 2exp20 RTCCLK seconds
RTC_SMOOTHCALIB_PERIOD_16SEC	If RTCCLK = 32768 Hz, Smooth calibration period is 16s, else 2exp19 RTCCLK seconds
RTC_SMOOTHCALIB_PERIOD_8SEC	If RTCCLK = 32768 Hz, Smooth calibration period is 8s, else 2exp18 RTCCLK seconds

RTC Smooth Calib Plus Pulses Definitions

RTC_SMOOTHCALIB_PLUSPULSES_SET	The number of RTCCLK pulses added during a X -second window = Y -

	CALM[8:0] with Y = 512, 256, 128 when X = 32, 16, 8
RTC_SMOOTHCALIB_PLUSPULSES_RESET	The number of RTCCLK pulses subbstited during a 32-second window = CALM[8:0]

RTC Tamper EraseBackUp Definitions

RTC_TAMPER_ERASE_BACKUP_ENABLE

RTC_TAMPER_ERASE_BACKUP_DISABLE

RTC Tamper Filter Definitions

RTC_TAMPERFILTER_DISABLE	Tamper filter is disabled
RTC_TAMPERFILTER_2SAMPLE	Tamper is activated after 2 consecutive samples at the active level
RTC_TAMPERFILTER_4SAMPLE	Tamper is activated after 4 consecutive samples at the active level
RTC_TAMPERFILTER_8SAMPLE	Tamper is activated after 8 consecutive samples at the active level.

RTC Tamper Interrupts Definitions

RTC_TAMPER1_INTERRUPT

RTC_TAMPER2_INTERRUPT

RTC_TAMPER3_INTERRUPT

RTC_ALL_TAMPER_INTERRUPT

RTC Tamper Mask Flag Definitions

RTC_TAMPERMASK_FLAG_DISABLE

RTC_TAMPERMASK_FLAG_ENABLE

RTC Tamper Pins Definitions

RTC_TAMPER_1

RTC_TAMPER_2

RTC_TAMPER_3

RTC Tamper Pin Precharge Duration Definitions

RTC_TAMPERPRECHARGEDURATION_1RTCCLK	Tamper pins are pre-charged before sampling during 1 RTCCLK cycle
RTC_TAMPERPRECHARGEDURATION_2RTCCLK	Tamper pins are pre-charged before sampling during 2 RTCCLK cycles
RTC_TAMPERPRECHARGEDURATION_4RTCCLK	Tamper pins are pre-charged before sampling during 4 RTCCLK cycles
RTC_TAMPERPRECHARGEDURATION_8RTCCLK	Tamper pins are pre-charged before sampling during 8 RTCCLK cycles

RTC Tamper Pull Up Definitions

RTC_TAMPER_PULLUP_ENABLE	TimeStamp on Tamper Detection event saved
RTC_TAMPER_PULLUP_DISABLE	TimeStamp on Tamper Detection event is not saved

RTC Tamper Sampling Frequencies Definitions

RTC_TAMPERSAMPLINGFREQ_RTCCLK_DIV32768	Each of the tamper inputs are sampled with a frequency = RTCCLK / 32768
RTC_TAMPERSAMPLINGFREQ_RTCCLK_DIV16384	Each of the tamper inputs are sampled with a frequency = RTCCLK / 16384
RTC_TAMPERSAMPLINGFREQ_RTCCLK_DIV8192	Each of the tamper inputs are sampled with a frequency = RTCCLK / 8192
RTC_TAMPERSAMPLINGFREQ_RTCCLK_DIV4096	Each of the tamper inputs are sampled with a frequency = RTCCLK / 4096
RTC_TAMPERSAMPLINGFREQ_RTCCLK_DIV2048	Each of the tamper inputs are sampled with a frequency = RTCCLK / 2048
RTC_TAMPERSAMPLINGFREQ_RTCCLK_DIV1024	Each of the tamper inputs are sampled with a frequency = RTCCLK / 1024
RTC_TAMPERSAMPLINGFREQ_RTCCLK_DIV512	Each of the tamper inputs are sampled with a frequency = RTCCLK / 512
RTC_TAMPERSAMPLINGFREQ_RTCCLK_DIV256	Each of the tamper inputs are sampled with a frequency = RTCCLK / 256

RTC Tamper TimeStamp On Tamper Detection Definitions

RTC_TIMESTAMPONTAMPERDETECTION_ENABLE	TimeStamp on Tamper Detection event saved
RTC_TIMESTAMPONTAMPERDETECTION_DISABLE	TimeStamp on Tamper Detection event is not saved

RTC Tamper Triggers Definitions

RTC_TAMPERTRIGGER_RISINGEDGE

RTC_TAMPERTRIGGER_FALLINGEDGE

RTC_TAMPERTRIGGER_LOWLEVEL

RTC_TAMPERTRIGGER_HIGHLEVEL

RTC TimeStamp Edges Definitions

RTC_TIMESTAMPEDGE_RISING

RTC_TIMESTAMPEDGE_FALLING

RTC TimeStamp Pins Selection

RTC_TIMESTAMPPIN_DEFAULT

RTC Wakeup Timer Definitions

RTC_WAKEUPCLOCK_RTCCLK_DIV16

RTC_WAKEUPCLOCK_RTCCLK_DIV8

RTC_WAKEUPCLOCK_RTCCLK_DIV4

RTC_WAKEUPCLOCK_RTCCLK_DIV2

RTC_WAKEUPCLOCK_CK_SPRE_16BITS

RTC_WAKEUPCLOCK_CK_SPRE_17BITS

56 HAL SAI Generic Driver

56.1 SAI Firmware driver registers structures

56.1.1 SAI_PdmInitTypeDef

Data Fields

- ***FunctionalState Activation***
- ***uint32_t MicPairsNbr***
- ***uint32_t ClockEnable***

Field Documentation

- ***FunctionalState SAI_PdmInitTypeDef::Activation***
  Enable/disable PDM interface
- ***uint32_t SAI_PdmInitTypeDef::MicPairsNbr***
  Specifies the number of microphone pairs used. This parameter must be a number between Min_Data = 1 and Max_Data = 3.
- ***uint32_t SAI_PdmInitTypeDef::ClockEnable***
  Specifies which clock must be enabled. This parameter can be a values combination of ***SAI_PDM_ClockEnable***

56.1.2 SAI_InitTypeDef

Data Fields

- ***uint32_t AudioMode***
- ***uint32_t Synchro***
- ***uint32_t SynchroExt***
- ***uint32_t OutputDrive***
- ***uint32_t NoDivider***
- ***uint32_t FIFOThreshold***
- ***uint32_t AudioFrequency***
- ***uint32_t Mckdiv***
- ***uint32_t MckOverSampling***
- ***uint32_t MonoStereoMode***
- ***uint32_t CompandingMode***
- ***uint32_t TriState***
- ***SAI_PdmInitTypeDef PdmInit***
- ***uint32_t Protocol***
- ***uint32_t DataSize***
- ***uint32_t FirstBit***
- ***uint32_t ClockStrobing***

Field Documentation

- ***uint32_t SAI_InitTypeDef::AudioMode***
  Specifies the SAI Block audio Mode. This parameter can be a value of ***SAI_Block_Mode***
- ***uint32_t SAI_InitTypeDef::Synchro***
  Specifies SAI Block synchronization This parameter can be a value of ***SAI_Block_Synchronization***