

Application Note for E909.05 and E909.6 Firmware 4.0

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Chapter 1

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1.1 Application Note for E909.05 and E909.6 Firmware File List

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

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Application Note for E909.05 and E909.6 Firmware File Documentation

2.1 main.c File Reference

Application example to demonstrate the usage of the E909.05 and the E909.06 HALIOS IC firmware. It shows the usage of measurements and the sample timing.

```
#include "firmware.h"  
#include "main.h"
```

Functions

- const uint16_t gui_applicationVersion [__attribute__](#) ((section(".application_version")))
- void [isr_wakeup](#) (void)
- int [main](#) (int argc, char *argv[])

Variables

- const char [gArc_project_number](#) [] = "0908503"

2.1.1 Detailed Description

Application example to demonstrate the usage of the E909.05 and the E909.06 HALIOS IC firmware. It shows the usage of measurements and the sample timing.

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Date:

Created: 2008-11-18

Author:

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Date:

Changed: 2008-12-03 Reworked documentation

Author:

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Date:

Changed: 2010-05-28 Reworked for firmware V4.0

Author:

Markus Kilian, Mechaless Systems GmbH

Date:

Changed: 2010-05-31 Reworked for firmware V4.0

Author:

Markus Kilian, Mechaless Systems GmbH

Date:

Changed: 2010-09-14 Makro request for __cplusplus added. Firmware now runs with c++.

Id

[main.c](#),v 1.3 2011/03/17 15:38:14 mki Exp

Definition in file [main.c](#).

2.1.2 Function Documentation

2.1.2.1 `const uint16_t gui_applicationVersion __attribute__((section(".application_version")))`

Set a project application version number. Set to a fix area at FLASH to make possible read out in output file and verify the flashed code.

2.1.2.2 `void isr_wakeup (void)`

Interrupt function Wakeup occurred - Set wakeupEnd and do a measurement

Definition at line 59 of file main.c.

2.1.2.3 `int main (int argc, char * argv[])`

main

Parameters:

← *argc* dummy parameter

← *argv* dummy parameter

```

**/
loopConf_t t_loopConf;

/**
 * Initializes the HALIOS SFRs and set up the basic functions of hardware.
 * @n It is recommend to call this function as first call.
 *
 * @post The system is configured:
 * - The trimmvalues are read from InfoBlock and set to
 *   mclk and wkclk (only at (E909.05)
 * - Following interrupts are enabled:
 *   - HALIOS measurement ready
 *   - wakeup timer
 * - Following GPIO settings are used:
 *   - The RDY_PIN will set as output,
 *     if no readypin is needed set RDY_PIN as 0
 * - Wakup timer enabled and set to 10 ms, used for sample time
 * - One HALIOS loop enabled and set up (one LED against compensator).
 *
 * @param [in] BIT0 Set a GPIO as trigger pin for measurement, use only one bit.
 *             If not needed set to 0.

```

```

*/
haliosInitialize(BIT0);

/**
 * Set the projectnumber (eight characters) to g_sfr.project_number to make
 * readable about the constant reading mechanism @ref paramCheckSfr.
 *
 * @param[in] gArc_project_number Pointer to a string. The maximum numbers of eight ch
 */
paramSetProjectNr((uint8_t*)(gArc_project_number));

/** Setup the register of the watchdog timer0.
 *
 * Configure the watchdog in milliseconds (ms).
 *
 * @param[in] 500 Watchdogtime in ms.
 * @n Must be smaller than 500 seconds (s)!
 * @n Higher Values will ignore and set to 500 s
 */
deviceSetWatchdogTime (500UL);

/** set IO port function to GPIO for all pins */
POCFG = 0;

/**
 * Define which communication device will be used and enable or disable the
 * related interrupts.
 * @n This function is optional. If this function is not called, communication
 * devices set all to off.
 *
 * @param[in] DEVCOM_I2C set communication to I2C
 * - For no communication device use (@ref DEVCOM_NO_COMM)
 * - For I2C (@ref DEVCOM_I2C)
 * - For SPI (@ref DEVCOM_SPI).
 * - For SPI and I2C (@ref DEVCOM_I2C | @ref DEVCOM_SPI)
 */
deviceSetCommDevice(DEVCOM_I2C);

/**
 * Call this function to show the last reset reason at a pin
 * by a significant bit pattern.
 * @n This function is optional. Use only if you don't want to
 * do your own fail state.
 * @n
 * @n Count the blink sequence of the output pin:
 * - 4 times blinking: watchdog reset
 * - 5 times blinking: CPU register parity error
 * - 6 times blinking: FLASH uncorrectable bit error
 * - 7 times blinking: RAM perity error
 * - 8 times blinking: Trap
 * @n @n

```

```
* @param[in] outputPin Define the pin which should do the failState show
* @param[in] inputPin Define the pin which break the failState show.
*
*           Set to 0 if now break is required
*/
failState(BIT2, BIT3);

/**
* Compute the checksum over all words in "Parameter FLASH Area".
* If the Checksum proofs "Valid Data", data is copied from the
* "Parameter FLASH Area" into RAM.
*
* @return
*   - -1: No valid data found.
*   - else: Number of copied words.
*/
if (deviceRestore() == -1)
{
    /**
    * Set the sample time in milli seconds. The wakeup timer
    * of the Analog Control Module is used for the timing.
    * Depending on the communication device the micro-controller
    * switches to STANDBY or STOP mode.
    *
    * @note time in milli seconds, must be between 2 and 32, only even
    * values are accepted. (See also description of the Analog Control Module).
    */
    paramSetSampleTime(8);

    /**
    * Set the amount of active loops.
    *
    * @param[in] count Amount of active loops. @a count must be less or equal to
    * @ref LOOPMAXCOUNT.
    * @return An element of the @a HaliosCode enumeration:
    *   - HALIOS_OK: No error occurred
    *   - HALIOS_PARAM: Wrong parameter for count passed.
    */
    haliosSetLoopCount(4);

    /**
    * Configuration of the 1st loop.
    * This is an example how to use type loopConf_t for loop configuration.
    * The values are indices for the LED current of the ASIC.
    */
    t_loopConf.loopNr = 0;
    t_loopConf.ledConf = H_LED3B | H_LED5A | H_AON | H_ACCON;
    t_loopConf.phaseA.range = 10;
    t_loopConf.phaseA.offset = 22;
    t_loopConf.phaseB.range = 15;
    t_loopConf.phaseB.offset = 15;
    t_loopConf.iConfC = 26;
}
```

```

t_loopConf.DC_offset = 0;
t_loopConf.PreAmp = 0;
t_loopConf.ClockConf = 0;

/**
 * Store the configuration data into the virtuel loops at SFR by using
 * a struct @ref LoopConf.
 *
 * @param[in] t_LoopConfig The LED and current configuration.
 *
 * @return An element of the @ref HaliosCode enumeration:
 * - HALIOS_OK: No error occurred
 * - HALIOS_PARAM: Wrong parameter in @a t_LoopConfig passed.
 */
haliosLoopInit(t_loopConf);

/**
 * Store the configuration data into the virtuel loops at SFR by direct access.
 *
 * @note No validation check will done. It is recommand to use
 * the function @ref haliosLoopInit.
 *
 * @param[in] loopNr 0 .. @ref LOOPMAXCOUNT
 * @param[in] ledConf LED and measurement configuration.
 * @param[in] iClockConf Measurement Configuration HALIOS Clock
 * @param[in] iConfA Current configuration for phase A.
 * @param[in] iConfB Current configuration for phase B.
 * @param[in] iConfC Current configuration for the compensator offset.
 * @param[in] iPreAmp Preamplifier Configuration
 */
haliosLoopInitialize(1, 20993, 0, 875, 495, 27, 0);
haliosLoopInitialize(2, 20996, 0, 810, 495, 25, 0);
haliosLoopInitialize(3, 21056, 0, 908, 495, 29, 0);

/**
 * Set System Status to be used for @ref deviceWaitForTimer during wait
 * until timer has elapsed or a interrupt wakes up the system.
 * @n This function is optional. If not called system status is STANDBY.
 * @n
 * @param[in] SystemStatus Selects system mode for deviceWaitForTimer
 * - DEVSET_RUN: Keep System in RUN Mode in deviceWaitForTimer
 * - DEVSET_STANDBY: Switch to STANDBY Mode in deviceWaitForTimer
 * - DEVSET_STOP: Switch to STOP Mode in deviceWaitForTimer
 * - DEVSET_OFF: Switch to OFF Mode in deviceWaitForTimer
 *
 * Keep in mind that spi-usb communication only works in RUN and in STANDBY mode.
 */
deviceSetSystemStatus(DEVSET_STANDBY);

/**
 * Write a value to the userspace

```

```
*
* These values could be read using I2C Protocol or
* USB (and HACo).
*
* The size of user space is 255 words.
*/
paramSetValue(0, 500);
}

/**
* Check the contents of SFR and does any special functions.
* If the content of a SFR register has changed the new values will be copied
* into the corresponding firmware functions or corresponding hardware registers.
* - Set size of SFR and user space to address @ref BUFFSIZE at SFR
* - Set constant reading values to SFR controled by @ref READ_CONST_CMD
* - Set systemStatus
* - Set Communication device
* - Set sampletime
* - Use spezial functions (use careful)
* - Set main clock (ANALOG_MCLK) (Only E909.05)
* - Set wakeup clock (ANALOG_WKCLK) (Only E909.05)
* - Set HALIOS frequency (Only E909.06)
* - Set number of Loops to g_sfr.loopCount
*/
paramCheckSfr();

/** Set GPIO 2..5 as output pins */
PDIR &= ~(BIT2 | BIT3 | BIT4 | BIT5);

/** Set application bit and Version */
g_sfr.inst_libs |= BIT15;
deviceCheckVersion(BIT15, gui_applicationVersion);

/**
*
* Do the measurement in an endless loop
*
*/
while (1)
{
    /**
    * Start and retrigger the watchdog timer. This is an inline function.
    *
    * @note At E909.06: After first call of watchdog it is not possible
    * to disable the watchdog or change the watchdog time.
    *
    */
    KICKDOG();

    /**
    * Check the contents of SFR and does any special functions.

```

```

* If the content of a SFR register has changed the new values will be copied
* into the corresponding firmware functions or corresponding hardware registers.
* - Set size of SFR and user space to address @ref BUFFSIZE at SFR
* - Set constant reading values to SFR controlled by @ref READ_CONST_CMD
* - Set systemStatus
* - Set Communication device
* - Set sampletime
* - Use spezial functions (use careful)
* - Set main clock (ANALOG_MCLK) (Only E909.05)
* - Set wakeup clock (ANALOG_WKCLK) (Only E909.05)
* - Set HALIOS frequency (Only E909.06)
* - Set number of Loops to g_sfr.loopCount
*/
paramCheckSfr();

/**
* Do the HALIOS measurement of all configurated loops.
* - Enable the analog part
* - Start one Warmup to engage the analog part
* - Start the configured measurements
* - disable the analog part
* - count up the @ref TIME_STAMP
*
* When haliosMeasure() is called with parameter HALIOS_RDYON,
* the configured PIN in haliosInitialize() will be switched on
* when entering the haliosMeasure() function,
* and will be switched off when haliosMeasure() is left.
*
* @param[in] readyPin @ref HaliosCode
* - @ref HALIOS_RDYON GPIO is used as ready pin.
* - @ref HALIOS_RDYOFF GPIO is not used as ready pin.
*/
haliosMeasure(HALIOS_RDYON);

/**
* To get the measurement result use the function haliosGetResult ()
*/
if (haliosGetResult(0) > 500)
{
    /** Set GPIO Pin2 if measurement result is above 500 */
    P0OUT |= BIT2;
}
else
{
    /** Reset GPIO Pin2 if measurement result is below 500 */
    P0OUT &= ~BIT2;
}

/**
* Wait until the timer has elapsed.
*/

```

```
deviceWaitForTimer();
```

```
/**
```

Definition at line 70 of file main.c.

References `gArc_project_number`.

2.2 main.h File Reference

Defines

- #define [APPLICATION_VERSION](#) 103UL

2.2.1 Detailed Description

Header file for the example application.

Author:

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Date:

Created: 2007-03-13

Author:

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Date:

Changed: 2008-11-26 added comments, added missing include "firmware.h"

Author:

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Date:

Changed: 2010-05-28 Reworked for firmware V4.0

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Date:

Changed: 2010-05-31 Reworked for firmware V4.0 added comments, removed obsolete include "firmware.h"

Author:

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Date:

Changed: 2010-07-13 Due to compatibility for GCC firmware library 4.01 available. Application version set to 1.01.

Author:

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Date:

Changed: 2010-08-12 Application version set to 1.02 Firmware library updated to 4.03 HALIOS tools library updated to 4.01

Author:

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Date:

Changed: 2011-03-17 Application version set to 1.03 Firmware library updated to 4.05

Definition in file [main.h](#).

2.2.2 Define Documentation

2.2.2.1 #define APPLICATION_VERSION 103UL

Version number for the application.

Definition at line 36 of file main.h.

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