chipKIT™ RTCCI2C Library Reference Manual

Revision: December 14, 2011

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Overview

The RTCCI2C MPIDE library provides a programming interface for a real-time clock/calendar. This document provides an overview of this device library and describes the functions that make up its programming interface.

The targeted I^2C real-time clock/calendar is powered by the Microchip MCP79410. It has two available alarms and a receptacle for a back-up battery. A multi-functional pin (MFP) is located on the device; it can be used as an alarm indicator.

Library Operation

Library Interface

The header file RTCCI2C.h declares the programming interface for the real-time clock/calendar device. The library is accessed via the methods defined for the RTCCI2C object class. To instantiate an RTCCI2C object, simply include the library and instantiate an RTCCI2C object (e.g., myRTCC, or whatever name you want).

RTCCI2C Initialization

The real-time clock/calendar is accessed by the I^2C interface. Before making calls to any other library functions, begin() must be called in order to setup I^2C.

Clock Functions

The real-time clock/calendar can be started by calling startClock() and stopped by calling stopClock(). To avoid incorrect data, it is best to stop the clock before setting any real-time clock/calendar parameters (seconds, minutes, etc.)

Alarm Functions

There are two alarms available on the real-time clock/calendar device. These alarms can be enabled and configured by calling enableAlarm(), turned off until the next matching condition by calling alarmOff(), permanently disabled by calling disableAlarm(), and checked for an alarm trigger by calling checkFlag().

Back-up Battery Mode

The real-time clock/calendar device can be backed-up with a battery. To use the back-up battery, back-up battery mode must be enabled by calling enableVbat(). Once the device enters back-up battery mode, bit 4 of the RTCC_RTCC day register (VBAT) is set and the entry time is stored in the

power-down time-stamp registers after approximately five seconds. When the device exits back-up battery mode, the exit time is stored in the power-up time-stamp registers. VBAT and the time-stamp will be cleared when writing to the RTCC_RTCC day register. Therefore, the time-stamp must be recorded before calling setDay(), enableVbat, or disableVbat().

Set/Get Functions

The second, minute, hour, day, date, month, and year parameters of the real-time clock/calendar (RTCC_RTCC), alarm 0 (RTCC_ALM0), alarm 1 (RTCC_ALM1), power-down time-stamp (RTCC_PWRD), and power-up time-stamp (RTCC_PWRU) can be set and read with the set/get functions. All parameters are represented in hexadecimal. There are two available hour formats, the 12-hour format and the 24-hour format. Both formats are available for use in this library, however the hour format needs to be consistent throughout the program. The second parameter is not available for RTCC_PWRD or RTCC_PWRU. The year parameter is only available for the RTCC_RTCC.

RTCCI2C Library Functions

Initialization

void begin(void)
Parameters:
None

Sets up I2C.

Clock Functions

void startClock(void)
Parameters:
None

Starts the RTCC_RTCC.

void stopClock(void)
Parameters:
None

Stops the RTCC_RTCC.

Alarm Functions

void enableAlarm(uint8_t dest, uint8_t config)
Parameters:

dest	RTCC_ALM0 for alarm 0 RTCC_ALM1 for alarm 1
config	alarm configuration bits

RTCC_ALM_POL | RTCC_ALMC2 | RTCC_ALMC1 | RTCC_ALMC0

RTCC_ALM_POL	MPF outputs high when the alarm is triggered
NONE	seconds match
RTCC_ALMC0	minutes match
RTCC_ALMC1	hours match
RTCC_ALMC1 | RTCC_ALMC0	matches on day at midnight
RTCC_ALMC2	date match
RTCC_ALMC2 | RTCC_ALMC1 | RTCC_ALMC0	seconds, minutes, hour, day, date, and month match

Enables and configures the destination alarm.

void disableAlarm(uint8_t dest)

Parameters:

dest	RTCC_ALM0 for alarm 0
	RTCC_ALM1 for alarm 1

Disables the destination alarm and clears the alarm interrupt flag for that alarm.

void alarmOff(uint8_t dest)

Parameters:

dest	RTCC_ALM0 for alarm 0
	RTCC_ALM1 for alarm 1

Clears the alarm interrupt flag for the dest alarm.

unsigned int checkFlag(uint8_t src)

Parameters:

dest	RTCC_ALM0 for alarm 0	
	RTCC_ALM1 for alarm 1	

Return Value:

unsigned int	1	alarm triggered
	0	alarm not triggered

Checks if the source alarm has been triggered.

Backup Battery Mode

void enableVbat(void)

Parameters:

None

Enables backup battery mode.

void disableVbat(void)

Parameters:

None

Disables backup battery mode.

Get Functions

uint8_t getSec(uint8_t src)

Parameters:

src	RTCC_RTCC	Real-time clock/calendar
	RTCC_ALM0	Alarm 0
	RTCC_ALM1	Alarm 1
	RTCC_PWRU and RTCC_PWRD do not have the second parameter	

Return Value:

uint8_t	second in hexadecimal

Returns the second of the source.

uint8_t getMin(uint8_t src)

Parameters:

src	RTCC_RTCC	Real-time clock/calendar
	RTCC_ALM0	Alarm 0
	RTCC_ALM1	Alarm 1
	RTCC_PWRD	Power-down time-stamp
	RTCC_PWRU	Power-up time-stamp

Return Value:

uint8_t	minute in hexadecimal

Returns the minute of the source.

uint8_t getHour(uint8_t src)

Parameters:

src	RTCC_RTCC	Real-time clock/calendar
	RTCC_ALM0	Alarm 0
	RTCC_ALM1	Alarm 1
	RTCC_PWRD	Power-down time-stamp
	RTCC_PWRU	Power-up time-stamp

Return Value:

uint8_t	hour in hexadecimal

Returns the hour of the source.

uint8_t getAmPm(uint8_t src)

Parameters:

src	RTCC_RTCC	Real-time clock/calendar
	RTCC_ALM0	Alarm 0
	RTCC_ALM1	Alarm 1
	RTCC_PWRD	Power-down time-stamp
	RTCC_PWRU	Power-up time-stamp

Return Value:

uint8_t	0	AM
	1	PM

Returns AM/PM for the source. This function should only be used in 12-hour format.

uint8_t getDay(uint8_t src)

Parameters:

src	RTCC_RTCC	Real-time clock/calendar
	RTCC_ALM0	Alarm 0
	RTCC_ALM1	Alarm 1
	RTCC_PWRD	Power-down time-stamp
	RTCC_PWRU	Power-up time-stamp

Return Value:

uint8_t	day in hexadecimal

Returns the day of the source.

uint8_t getDate(uint8_t src)

Parameters:

src	RTCC_RTCC	Real-time clock/calendar
	RTCC_ALM0	Alarm 0
	RTCC_ALM1	Alarm 1
	RTCC_PWRD	Power-down time-stamp
	RTCC_PWRU	Power-up time-stamp

Return Value:

uint8_t	date in hexadecimal

Returns the date of the source.

uint8_t getMonth(uint8_t src)

Parameters:

src	RTCC_RTCC	Real-time clock/calendar
	RTCC_ALM0	Alarm 0
	RTCC_ALM1	Alarm 1
	RTCC_PWRD	Power-down time-stamp
	RTCC_PWRU	Power-up time-stamp

Return Value:

uint8_t	month in hexadecimal

Returns the month of the source.

uint8_t getYear

Parameters:

None.

Return Value:

uint8_t	year in hexadecimal

Returns the year of the RTCC_RTCC. The year parameter is only available for the RTCC_RTCC.

Set Functions

void setSec(uint8_t dest, uint8_t value)

Parameters:

src	RTCC_RTCC	Real-time clock/calendar
	RTCC_ALM0	Alarm 0
	RTCC_ALM1	Alarm 1
value	desired value for the second in HEX 0x00-0x59	

Sets the second register of the destination with the value.

void setMin(uint8_t dest, uint8_t value)

Parameters:

src	RTCC_RTCC	Real-time clock/calendar
	RTCC_ALM0	Alarm 0
	RTCC_ALM1	Alarm 1
value	desired value for the minute in HEX 0x00-0x59	

Sets the minute register of the destination with the value.

void setHour(uint8_t dest, uint8_t value, uint8_t ampm)

Parameters:

src	RTCC_RTCC	Real-time clock/calendar
	RTCC_ALM0	Alarm 0
	RTCC_ALM1	Alarm 1
value	desired value for the hour in 12-hour format The value should be represented in HEX and should be between 0x01-0x12.	
ampm	RTCC_AM	
	RTCC_PM	

Sets the hour register of the destination with the value in 12-hour format.

void setHour(uint8_t dest, uint8_t value)

Parameters:

src	RTCC_RTCC	Real-time clock/calendar
	RTCC_ALM0	Alarm 0
	RTCC_ALM1	Alarm 1
value	desired value for the hour in 24-hour format The value should be represented in HEX and should be between 0x00-0x23.	

Sets the hour register of the destination with the value in 24-hour format.

void setDay(uint8_t dest, uint8_t value)

Parameters:

src	RTCC_RTCC	Real-time clock/calendar
	RTCC_ALM0	Alarm 0
	RTCC_ALM1	Alarm 1
value	desired value for the day in HEX 0x01-0x07	

Sets the day register of the destination with the specified value.

void setDate(uint8_t dest, uint8_t value)

Parameters:

src	RTCC_RTCC	Real-time clock/calendar
	RTCC_ALM0	Alarm 0
	RTCC_ALM1	Alarm 1
value	desired value for the date in HEX 0x01-0x31	

Sets the date register of the destination with the specified value.

void setMonth(uint8_t dest, uint8_t value)

Parameters:

src	RTCC_RTCC	Real-time clock/calendar
	RTCC_ALM0	Alarm 0
	RTCC_ALM1	Alarm 1
value	desired value for the month in HEX 0x01-0x12	

Sets the month register of the destination with the specified value.

void setYear(uint8_t value)

Parameters:

value	desired value for the month in HEX 0x00-0x99

Sets the year register of the RTCC_RTCC with the specified value. The year parameter is only available in RTCC_RTCC.