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User's Manual

Renesas Embedded Application Programming Interface

User's Manual

for SH/Tiny

Renesas Electronics
www.renesas.com

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Table of Contents

1. Introduction

The Renesas Embedded Application Programming Interface (Renesas Embedded API; hereinafter “this library”) is a unified API for the microcomputers made by Renesas System Solutions (Beijing) Co., Ltd.

2. Driver

2.1. Overview

This library provides a peripheral function control program (peripheral driver) for microcomputer and allows the peripheral driver to be built into a user program.

2.2. Control Function

This library has the following control functions available as a peripheral driver.

(1) Serial Communication Interface

This library comprises a serial communication interface driver, which sets or clears operating conditions of serial communication, as well as controls and manages the transmission/reception of data.

(2) Timer

This library comprises a timer driver, which sets or clears operating conditions of timers, as well as controls the timer operation.

(3) I/O Port

This library comprises an I/O port driver, which sets or clears conditions of use for I/O ports, as well as control data read/write operation.

(4) External Interrupt

This library comprises an external interrupt driver, which sets or clears conditions of use for external interrupts, as well as controls interrupt operation.

(5) A/D Converter

This library comprises an A/D converter driver, which sets or clears conditions of use for A/D converter, as well as controls A/D converter operation.

2.3. Serial Communication Interface Driver

The serial communication interface driver establishes or clears the serial communication, and transmits or receives data. It is also used to control the status of the serial communication.

2.4. Timer Driver

The timer driver sets or clears the timer, and controls timer operation. It is also used to acquire counter values in following modes:

- Timer mode
- Event counter mode
- Pulse width modulation mode (PWM mode)
- Pulse period measurement mode
- Pulse width measurement mode
- Input capture mode
- Output compare mode

2.4.1. Timer Mode

In this mode, the timer counts the internally-generated count source. When a compare match interrupt or an overflow interrupt occurs, a preset callback function is called.

2.4.2. Event Counter Mode

In this mode, the timer counts the external signal from an input pin or other counter's overflow/underflow. When a compare match interrupt, an input capture interrupt, or an overflow/underflow interrupt occurs, a preset callback function is called.

2.4.3. Pulse Width Modulation Mode (PWM Mode)

In this mode, the timer outputs pulses in a given width successively. When a compare match interrupt occurs, a preset callback function is called.

2.4.4. Pulse Period Measurement Mode

In this mode, the timer measures the pulse period of an external signal from an input pin. When an input capture interrupt or an overflow interrupt occurs, a preset callback function is called.

2.4.5. Pulse Width Measurement Mode

In this mode, the timer measures the pulse width of an external signal fed in from an input pin. When an input capture interrupt or an overflow interrupt occurs, a preset callback function is called.

2.4.6. Input Capture Mode

In this mode, the timer latches the timer value upon an active signal edge or clock pulse at an input pin, thereby generating an interrupt request. When an input capture interrupt or an overflow interrupt occurs, a preset callback function is called.

2.4.7. Output Compare Mode

In this mode, the timer generates an interrupt request when the timer counter and a comparison value match. When a compare match interrupt or an overflow interrupt occurs, a preset callback function is called.

2.5. I/O Port Driver

The I/O port driver sets I/O port as the input or output, writes data to the I/O port, and reads data from the I/O port.

2.6. External Interrupt Driver

The external interrupt driver sets or controls external interrupts, and acquires or clears the status of the external interrupt flags.

2.7. A/D Converter Driver

The A/D converter driver sets and controls A/D converter, and also clears the setting. It is also used to obtain the A/D conversion value, and acquires or clears the status of A/D converter.

3. Standard Type

This chapter describes the standard type defined in this library. For details about the setting values, refer to the section "4.2 Description of Each API".

Table 3.1 Standard Type

Standard type	Description
Boolean	Boolean type represents the enum-type data that indicates whether it is true (RAPI_TRUE (= 1)) or false (RAPI_FALSE (= 0)).
VoidFuncNotify	VoidFuncNotify type represents the type of the notification function to be registered.

4. Library Reference

4.1. API List by Peripheral Function

Table 4.1 and Table 4.2 list the Renesas Embedded APIs by peripheral functions.

Table 4.1 Renesas Embedded API List (1/2)

Category	No	Name	Description
Serial Communication Interface (SCI)	1	__CreateSCI	Setting of SCI
	2	__DestroySCI	Closing of serial port
	3	__StartSCIReceiving	Start of SCI reception
	4	__StartSCISending	Start of SCI transmission
	5	__StopSCIReceiving	Stop of SCI reception
	6	__StopSCISending	Stop of SCI transmission
	7	__PollingSCIReceiving	SCI reception by polling
	8	__PollingSCISending	SCI transmission by polling
	9	__GetSCIStatus	Acquisition of SCI status
	10	__ClearSCIStatus	Clearing of SCI status
	11	__OutputSCISck	Output control for SCK pin
	12	__OutputSCITxd	Output control for TXD pin
Timer	1	__CreateTimer	Setting for timer mode
	2	__EnableTimer	Operation control for timer mode
	3	__DestroyTimer	Clearing of setting for timer mode
	4	__CreateEventCounter	Setting for event counter mode
	5	__EnableEventCounter	Operation control for event counter mode
	6	__DestroyEventCounter	Clearing of setting for event counter mode
	7	__GetTimerCounter	Acquisition of counter value in timer mode or event counter mode
	8	__CreatePWM	Setting for pulse width modulation mode
	9	__SetPWMPin	Setting of timer general register for pulse width modulation
	10	__EnablePWM	Operation control for pulse width modulation mode
	11	__DestroyPWM	Clearing of setting for pulse width modulation mode
	12	__CreatePulsePeriodMeasurementMode	Setting for pulse period measurement mode
	13	__SetInputPeriodPin	Setting of input pin for pulse period measurement
	14	__EnablePulsePeriodMeasurementMode	Operation control for pulse period measurement mode
	15	__DestroyPulsePeriodMeasurementMode	Clearing of setting for pulse period measurement mode
	16	__GetPulsePeriodMeasurementMode	Acquisition of measured value in pulse period measurement mode
	17	__CreatePulseWidthMeasurementMode	Setting for pulse width measurement mode
	18	__SetInputWidthPin	Setting of input pin for pulse width measurement
	19	__EnablePulseWidthMeasurementMode	Operation control for pulse width measurement mode
	20	__DestroyPulseWidthMeasurementMode	Clearing of setting for pulse width measurement mode
	21	__GetPulseWidthMeasurementMode	Acquisition of measured value in pulse width measurement mode
	22	__CreateInputCapture	Setting for input capture mode
	23	__SetInputCapturePin	Setting of input pin for input capture
	24	__EnableInputCapture	Operation control for input capture mode
	25	__DestroyInputCapture	Clearing of setting for input capture mode
	26	__GetCaptureValue	Acquisition of counter value for input capture mode
	27	__CreateOutputCompare	Setting for output compare mode
	28	__SetOutputPin	Setting of timer general register for output compare
	29	__EnableOutputCompare	Operation control for output compare mode
	30	__DestroyOutputCompare	Clearing of setting for output compare mode
	31	__GetTimerFlag	Acquisition of timer status
	32	__ClearTimerFlag	Clearing of timer status

Table 4.2 Renesas Embedded API List (2/2)

Category	No	Name	Description
I/O port	1	__SetIOPort	Setting of I/O port
	2	__ReadIOPort	Reading of data from I/O port
	3	__WriteIOPort	Writing of data to I/O port
External interrupt	1	__CreateInterrupt	Setting of external interrupt
	2	__EnableInterrupt	Operation control for external interrupt
	3	__GetInterruptAndPinInfo	Acquisition of input-pin level for external interrupt, and the status of interrupt request
	4	__ClearInterruptFlag	Clearing of status of interrupt request
A/D converter	1	__CreateADC	Setting of A/D converter
	2	__EnableADC	Operation control for A/D converter
	3	__DestroyADC	Clearing of setting of A/D converter
	4	__GetADC	Acquisition of A/D conversion result
	5	__GetADCFlag	Acquisition of A/D converter status
	6	__ClearADCFlag	Clearing of A/D converter status

4.2. Description of Each API

This section describes each API and explains how to use them, showing a program example for each. The description of each API is divided into the following items.

Synopsis	Summarizes processing by the API function, and shows its format. Then also gives a brief explanation of arguments.
Description	Explains how to use the API function and shows assignable parameters separating each argument with **[*argument*]**.
Return value	Describes the returned value of the API function.
Category	Indicates the category of the API function.
Reference	Indicates the API functions to be referred.
Remark	Describes notes to use the API function.
Program example	Represents how to use the API function by a program example.

4.2.1. Serial Communication Interface (SCI)

1) __CreateSCI

Synopsis

<Setting of SCI>

Boolean __CreateSCI(unsigned long data1, unsigned short data2)

data1	Setup data 1
data2	Setup data 2

Description (1/2)

Sets SCI according to the specified parameters.

[data1]

For data1, set the following parameters. To set multiple parameters at the same time, use the symbol "|" to separate each specified parameter.

- Channel: (Multiple channels can be selected)

RAPI_COM1	SCI channel 0
RAPI_COM2	SCI channel 1
RAPI_COM3	SCI channel 2

- Operation for SCI: (Choose one from the following)

RAPI_SM_SYNC	Clock synchronous mode
RAPI_SM_ASYNC	Clock asynchronous mode

- Data length format in clock asynchronous mode: (Choose one from the following)

RAPI_7_BIT_LENGTH	7-bit data length
RAPI_8_BIT_LENGTH	8-bit data length

Note: Do not set these parameters in clock synchronous mode.

- Serial/parallel conversion format: (Choose one from the following)

RAPI_LSB_SEL	LSB first
RAPI_MSB_SEL	MSB first

Note: Do not set these parameters when 7-bit data is specified for the data length in clock asynchronous mode.

- SCI clock source select and clock output enable/disable from SCK pin:
  (Choose one from the following)

RAPI_CKDIR_INT	Internal clock, SCK pin used for input pin (CKE[1:0] = 00) (SCK pin used for clock ouput in clock synchronous mode)
RAPI_CKDIR_EXT	External clock, SCK pin used for clock input (CKE[1:0] = 10) (The input clock frequency is 16 times of the bit rate in clock asynchronous mode, and synchronous clock input in clock synchronous mode)

- Stop bit length in clock asynchronous mode:
  (Choose one from the following)

RAPI_STPB_1	One stop bit
RAPI_STPB_2	Two stop bits

Note: Do not set these parameters in clock synchronous mode.

- Clock source of the on-chip baud rate generator:
  (Choose one from the following)

RAPI_BCSS_P1	Pϕ clock
RAPI_BCSS_P4	Pϕ/4 clock
RAPI_BCSS_P16	Pϕ/16 clock
RAPI_BCSS_P64	Pϕ/64 clock

Description (2/2)

- Parity mode in clock asynchronous mode: (Choose one from the following)

RAPI_PARITY_NON	No parity bit
RAPI_PARITY_EVEN	Even parity bit
RAPI_PARITY_ODD	Odd parity bit

Note:
- This setting is invalid in multiprocessor mode.
- Do not set these parameters in clock synchronous mode.

- Multiprocessor mode in clock asynchronous mode (enable/disable): (Choose one from the following)

RAPI_MULTI_ENA	Enables multiprocessor mode
RAPI_MULTI_DIS	Disables multiprocessor mode

Note: Do not set these parameters in clock synchronous mode.

- Multiprocessor bit value in clock asynchronous mode: (Choose one from the following)

RAPI_MULTIPRO_BIT_H	Specifies the multiprocessor bit value to 1
RAPI_MULTIPRO_BIT_L	Specifies the multiprocessor bit value to 0

Note: Do not set these parameters in clock synchronous mode.

- SCI interrupt source: (Multiple sources can be selected)

RAPI_INT_TX_ENA	Enables the transmit-data-empty interrupt
RAPI_INT_TEND_ENA	Enables the transmit-end interrupt
RAPI_INT_RX_ERR_ENA	Enables the receive-data-full and the receive-error interrupts
RAPI_INT_ERR_ENA	Enables the receive-error interrupt
RAPI_INT_MULTI_ENA	Enables the multiprocessor interrupt

- Transmit/Receive interrupt priority level: (Choose one from the following)

RAPI_SCI_INT_LV_0	Interrupt priority level 0
RAPI_SCI_INT_LV_1	Interrupt priority level 1
RAPI_SCI_INT_LV_2	Interrupt priority level 2
RAPI_SCI_INT_LV_3	Interrupt priority level 3
RAPI_SCI_INT_LV_4	Interrupt priority level 4
RAPI_SCI_INT_LV_5	Interrupt priority level 5
RAPI_SCI_INT_LV_6	Interrupt priority level 6
RAPI_SCI_INT_LV_7	Interrupt priority level 7
RAPI_SCI_INT_LV_8	Interrupt priority level 8
RAPI_SCI_INT_LV_9	Interrupt priority level 9
RAPI_SCI_INT_LV_10	Interrupt priority level 10
RAPI_SCI_INT_LV_11	Interrupt priority level 11
RAPI_SCI_INT_LV_12	Interrupt priority level 12
RAPI_SCI_INT_LV_13	Interrupt priority level 13
RAPI_SCI_INT_LV_14	Interrupt priority level 14
RAPI_SCI_INT_LV_15	Interrupt priority level 15

[data2]
For data2, set value (N; 0≤N≤255) of bit rate register (SCBRR) in the baud rate generator.

Return value

If SCI communication is successful, RAPI_TRUE is returned; otherwise, RAPI_FALSE is returned.

Category

SCI

Reference

none

Remark

If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.

Program example

```
#include ”rapi_sif_sh_7125.h”

void func( void )
{
   /* Setting SCI channel 0 for clock synchronous mode */
   __CreateSCI( RAPI_COM1 | RAPI_SM_SYNC | RAPI_CKDIR_INT |
          RAPI_BCSS_P1 | RAPI_LSB_SEL | RAPI_INT_RX_ERR_ENA |
          RAPI_INT_LV_6, 20 );
}

/* Or */

void func( void )
{
   /* Setting SCI channel 0 for clock asynchronous mode */
   __CreateSCI( RAPI_COM1 | RAPI_SM_ASYNC | RAPI_8_BIT_LENGTH |
          RAPI_LSB_SEL | RAPI_STPB_1 | RAPI_CKDIR_INT |
          RAPI_BCSS_P1 | RAPI_PARITY_NON | RAPI_MULTI_DIS |
          RAPI_INT_RX_ERR_ENA | RAPI_SCI_INT_LV_6, 20 );
}
```

2) __DestroySCI

Synopsis

<Closing of serial port>
Boolean __DestroySCI(unsigned long data)

data	Setup data

Description

Stops clock supply to the specified serial port.

[data]
For data, set one of the following parameters as a channel.

RAPI_COM1	SCI channel 0
RAPI_COM2	SCI channel 1
RAPI_COM3	SCI channel 2

Return value

If the specification of serial port is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

SCI

Reference

__CreateSCI

Remark

If an undefined value is specified in the argument, operation of the API cannot be guaranteed.

Program example

```
#include ”rapi_sif_sh_7125.h”

void func( void )
{
   /* Closing serial port for SCI channel 0 */
   __DestroySCI( RAPI_COM1 );
}
```

3) __StartSCIReceiving

Synopsis

<Start of SCI reception>

Boolean __StartSCIReceiving(unsigned long data, unsigned char *RcvDtBuf, unsigned short byteNum, unsigned short *RcvNum)

data	Setup data
RcvDtBuf	Pointer to buffer storing the received data
byteNum	Number of bytes received
RcvNum	Pointer to address storing the number of actual received data

Description

Starts SCI reception and acquires received data with the specified number of bytes.

[data]

For data, set one of the following parameters as a channel.

RAPI_COM1	SCI channel 0
RAPI_COM2	SCI channel 1
RAPI_COM3	SCI channel 2

Return value

If start-up for SCI reception is successful, RAPI_TRUE is returned; otherwise, RAPI_FALSE is returned.

Category

SCI

Reference

__CreateSCI, __StopSCIReceiving, __GetSCIStatus

Remark

- When executing this API function, wait for at least a 1-bit period after __CreateSCI is called.
- If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.
- The following values are stored in the reception buffer.
  - High-order 8 bits: The value read from the serial status register (SCSSR).
  - Low-order 8 bits: The value read from the receive data register (SCRDR).

  Note: When the receive error occurs, read operation is not executed.

Program example

```
#include ”rapi_sif_sh_7125.h”

unsigned char ReceiveBuf[10];
unsigned short ReceiveNum;

void func( void )
{
   /* Aquisition of 5-byte data by SCI reception for channel 0 */
   __StartSCIReceiving( RAPI_COM1, ReceiveBuf, 5, &ReceiveNum );
}
```

4) __StartSCISending

Synopsis

<Start of SCI transmission>
Boolean __StartSCISending(unsigned long data, unsigned char *SndDtBuf, unsigned short byteNum, unsigned short *SndNum)

data	Setup data
SndDtBuf	Pointer to transmit data
byteNum	Number of bytes transmitted
SndNum	Pointer to address storing the number of the actual transmitted data

Description

Starts SCI transmission and transmits data with the specified number of bytes.

[data]
For data, set one of the following parameters as a channel.

RAPI_COM1	SCI channel 0
RAPI_COM2	SCI channel 1
RAPI_COM3	SCI channel 2

Return value

If start-up for SCI transmission is successful, RAPI_TRUE is returned; otherwise, RAPI_FALSE is returned.

Category

SCI

Reference

__CreateSCI, __StopSCISending, __GetSCIStatus

Remark

- When executing this API function, wait for at least a 1-bit period after __CreateSCI is called.
- If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.

Program example

```
#include ”rapi_sif_sh_7125.h”

unsigned char SendBuf[10];
unsigned short SendNum;

void func( void )
{
    /* Start-up SCI transmission for 5-byte data */
    __StartSCISending( RAPI_COM1, SendBuf, 5, &SendNum );
}
```

5) __StopSCIReceiving

Synopsis

<Stop of SCI reception>

Boolean __StopSCIReceiving(unsigned long data1, unsigned short data2)

data1	Setup data 1
data2	Setup data 2

Description

Stops SCI reception.

[data1]

For data1, set one of the following parameters as a channel.

RAPI_COM1	SCI channel 0
RAPI_COM2	SCI channel 1
RAPI_COM3	SCI channel 2

[data2]

For data2, specify the wait time until stopping SCI reception.

Return value

If stop of SCI reception is successful and there are no receive errors, RAPI_TRUE is returned; otherwise, RAPI_FALSE is returned.

Category

SCI

Reference

__StartSCIReceiving

Remark

If an undefined value is specified in the argument, operation of the API cannot be guaranteed.

Program example

```
#include ”rapi_sif_sh_7125.h”

void func( void )
{
   /* Stopping SCI reception for channel 0 */
   __StopSCIReceiving( RAPI_COM1, 50000 );
}
```

6) __StopSCISending

Synopsis

<Stop of SCI transmission>
Boolean __StopSCISending(unsigned long data1, unsigned short data2)

data1	Setup data 1
data2	Setup data 2

Description

Stops SCI transmission.

[data1]
For data1, set one of the following parameters as a channel.

RAPI_COM1	SCI channel 0
RAPI_COM2	SCI channel 1
RAPI_COM3	SCI channel 2

[data2]
For data2, specify the wait time until SCI transmission is stopped.

Return value

If stop of SCI transmission is successful, RAPI_TRUE is returned; otherwise, RAPI_FALSE is returned.

Category

SCI

Reference

__StartSCISending

Remark

- When executing in clock synchronous mode, SCI reception of data also stops.
- If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.

Program example

```
#include ”rapi_sif_sh_7125.h”

void func( void )
{
    /* Stopping SCI transmission for channel 0 */
    __StopSCISending( RAPI_COM1, 50000 );
}
```

7) __PollingSCIReceiving

Synopsis

<SCI reception by polling>

Boolean __PollingSCIReceiving(unsigned long data)

data	Setup data

Description

Receives data in serial communication by polling.
Acquires data with the size specified by __StartSCIReceiving.

[data]

For data, set one of the following parameters as a channel.

RAPI_COM1	SCI channel 0
RAPI_COM2	SCI channel 1
RAPI_COM3	SCI channel 2

Return value

If the specification of serial port or the received data is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

SCI

Reference

__GetSCIStatus, __StartSCIReceiving

Remark

If an undefined value is specified in the argument, operation of the API cannot be guaranteed.

Program example

```
#include ”rapi_sif_sh_7125.h”

unsigned char ReceiveBuf[10];
unsigned short ReceiveNum;

void INT_SCI0_RX( void );
void ErrorOpe( void );

/* Main routine */
void func( void )
{
   /* Setting SCI channel 0 to clock synchronous mode
      (Receive-data-full and receive-error interrupts enabled) */
   __CreateSCI( RAPI_COM1 | RAPI_SM_SYNC | RAPI_CKDIR_INT |
         RAPI_BCSS_P1 | RAPI_LSB_SEL | RAPI_INT_RX_ERR_ENA |
         RAPI_SCI_INT_LV_6, 20 );

   /* Setting receive-data size to 5 bytes and
      Start-up SCI reception */
   __StartSCIReceiving( RAPI_COM1, ReceiveBuf, 5, &ReceiveNum );
}

/* Interrupt routine for SCI reception */
void INT_SCI0_RX( void )
{
   /* Reception of 5-byte data */
   if( __PollingSCIReceiving( RAPI_COM1 ) == RAPI_TRUE ){
   /* Reception success */
      if( ReceiveNum == 5 ){
         /* End of 5-byte data reception*/
         __StopSCIReceiving( RAPI_COM1, 5000 );
       }
   }
   else{   /* Reception failure */
      ErrorOpe();   /* Error processing */
   }
}
```

8) __PollingSCISending

Synopsis

<SCI transmission by polling>

Boolean __PollingSCISending(unsigned long data)

data	Setup data

Description

Transmits data in the serial communication by polling. Transmits data in transmission buffer with the size specified by __StartSCISending.

[data]

For data, set one of the following parameters as a channel.

RAPI_COM1	SCI channel 0
RAPI_COM2	SCI channel 1
RAPI_COM3	SCI channel 2

Return value

If the specification of serial port is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

SCI

Reference

__StartSCISending

Remark

If an undefined value is specified in the argument, operation of the API cannot be guaranteed.

Program example

```
#include ”rapi_sif_sh_7125.h”

unsigned char SendBuf[10];
unsigned short SendNum;

void INT_SCI0_TX( void );

/* Main routine */
void func( void )
{
   /* Setting up SCI channel 0 to clock synchronous mode
      (Transmit-data-empty interrupt enabled) */
   __CreateSCI( RAPI_COM1 | RAPI_SM_SYNC | RAPI_CKDIR_INT |
         RAPI_BCSS_P1 | RAPI_LSB_SEL | RAPI_INT_TX_ENA |
         RAPI_SCI_INT_LV_6, 20 );

   /* Setting transmit-data size to 5 bytes and
      start-up SCI transmission */
   __StartSerialSending( RAPI_COM1, SendBuf, 5, &SendNum );
}

/* Interrupt routine for SCI transmission */
void INT_SCI0_TX( void )
{
   if( SendNum == 5 ){
      /* End of 5-byte data transmission*/
      __StopSCIsending( RAPI_COM1, 5000 );
   }
   else{
      /* Transmission of 5-byte data */
      __PollingSCISending( RAPI_COM1 );
   }
}
```

9) __GetSCIStatus

Synopsis

<Acquisition of SCI status>

Boolean __GetSCIStatus(unsigned long data, unsigned char *status)

data	Setup data
status	Byte address to store the receive error flag

Description

Acquires status of SCI transmission/reception.

[data]

For data, set the following parameters. To set multiple parameters at the same time, use the symbol "|" to separate each specified parameter.

RAPI_COM1	SCI channel 0
RAPI_COM2	SCI channel 1
RAPI_COM3	SCI channel 2
RAPI_TDRE	Transmit-data-register empty flag
RAPI_RDRF	Receive-data-register full flag
RAPI_ORER	Overrun error flag
RAPI_FER	Framing error flag
RAPI_PER	Parity error flag
RAPI_TEND	Transmit end flag
RAPI_MPB	Multiprocessor bit flag for reception
RAPI_MPBT	Multiprocessor bit flag for transmission
RAPI_RECV_ERROR	All receive error flags (Overrun, framing, and parity errors)
RAPI_ALL_FLAG	All status flags of SCI

Return value

If the specification of serial port is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

SCI

Reference

__ClearSCIStatus

Remark

If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.

Program example

```
#include ”rapi_sif_sh_7125.h”

unsigned char statusvalue;

void func( void )
{
    /* Acquisition of parity error flag for SCI channel 0 */
    return __GetSCIStatus( RAPI_COM1 | RAPI_PER, &statusvalue );
}
```

10) __ClearSCIStatus

Synopsis

<Clearing of SCI status>

Boolean __ClearSCIStatus(unsigned long data)

data	Setup data

Description

Clears status of SCI transmission/reception.

[data]

For data, set the following parameters. To set multiple parameters at the same time, use the symbol "|" to separate each specified parameter.

RAPI_COM1	SCI channel 0
RAPI_COM2	SCI channel 1
RAPI_COM3	SCI channel 2
RAPI_TDRE	Transmit-data-register empty flag
RAPI_RDRF	Receive-data-register full flag
RAPI_ORER	Overrun error flag
RAPI_FER	Framing error flag
RAPI_PER	Parity error flag
RAPI_TEND	Transmit end flag
RAPI_MPB	Multiprocessor bit flag for reception
RAPI_MPBT	Multiprocessor bit flag for transmission
RAPI_RECV_ERROR	All receive error flags of SCI (Overrun, framing, and parity errors)
RAPI_ALL_FLAG	All status flags of SCI

Return value

If the specification of serial port is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

SCI

Reference

__GetSCIStatus

Remark

If an undefined value is specified in the argument, operation of the API cannot be guaranteed.

Program example

```
#include ”rapi_sif_sh_7125.h”

void func( void )
{
    /* Clearing parity error flag for SCI channel 0 */
    return __ClearSCIStatus( RAPI_COM1 | RAPI_PER );
}
```

11) __OutputSCISck

Synopsis

<Output control for SCK pin>

Boolean __OutputSCISck(unsigned long data)

data	Setup data

Description

Controls output of the SCK pin in clock asynchronous mode.

[data]

For data, set the following parameters. To set multiple parameters at the same time, use the symbol "|" to separate each specified parameter.

RAPI_COM1	SCI channel 0
RAPI_COM2	SCI channel 1
RAPI_COM3	SCI channel 2
RAPI_SCK_OUTPUT	Outputs clock with a frequency of 16 times of the bit rate
RAPI_SCK_NO_OUTPUT	Does not output the SPB1DT bit value in serial port register (SCSPTR) through the SCK pin
RAPI_SCK_OUTPUT_L	Outputs the SPB1DT bit value in serial port register (SCSPTR) at low level through the SCK pin
RAPI_SCK_OUTPUT_H	Outputs the SPB1DT bit value in serial port register (SCSPTR) at high level through the SCK pin

Return value

If the specification of serial port is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

SCI

Reference

__CreateSCI

Remark

- When using the SCK pin as a port output pin, set the internal clock (RAPI_CKDIR_INT) as the clock source in __CreateSCI beforehand.
- If an undefined value is specified in the argument, operation of the API cannot be guaranteed.

Program example

```
#include ”rapi_sif_sh_7125.h”

void func( void )
{
    /* Setting up SCK pin as high-level output for channel 0 */
    return __OutputSCISck( RAPI_COM1 | RAPI_SCK_OUTPUT_H );
}
```

12) __OutputSCITxd

Synopsis

<Output control for TXD pin>

Boolean __OutputSCITxd(unsigned long data)

data	Setup data

Description

Controls output of the TXD pin in clock asynchronous mode.

[data]

For data, set the following parameters. To set multiple parameters at the same time, use the symbol "|" to separate each specified parameter.

RAPI_COM1	SCI channel 0
RAPI_COM2	SCI channel 1
RAPI_COM3	SCI channel 2
RAPI_TXD_BREAK_L	Sets the TXD pin as low-level output
RAPI_TXD_BREAK_H	Sets the TXD pin as high-level output

Return value

If the specification of serial port is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

SCI

Reference

none

Remark

If an undefined value is specified in the argument, operation of the API cannot be guaranteed.

Program example

```
#include ”rapi_sif_sh_7125.h”

void func( void )
{
   /* Setting up TXD pin as high-level output for channel 0 */
   return __OutputSCITxd( RAPI_COM1 | RAPI_TXD_BREAK_H );
}
```

4.2.2. Timer MTU2

1) __CreateTimer

Synopsis

<Setting for timer mode>

Boolean __CreateTimer(unsigned long data1, unsigned short data2, void *func)

data1	Setup data 1
data2	Setup data 2
func	Pointer to callback function

Description (1/7)

Sets the specified timer to timer mode.

[data1]

For data1, set the following parameters. To set multiple parameters at the same time, use the symbol "|" to separate each specified parameter.

RAPI_MTU2_0	MTU2 channel 0
RAPI_MTU2_1	MTU2 channel 1
RAPI_MTU2_2	MTU2 channel 2
RAPI_MTU2_3	MTU2 channel 3
RAPI_MTU2_4	MTU2 channel 4
RAPI_MTU2_5U	MTU2 channel 5U
RAPI_MTU2_5V	MTU2 channel 5V
RAPI_MTU2_5W	MTU2 channel 5W
RAPI_CMT_0	CMT channel 0
RAPI_CMT_1	CMT channel 1
RAPI_MP1	Internal clock: counts on MPϕ/1
RAPI_MP4	Internal clock: counts on MPϕ/4
RAPI_MP16	Internal clock: counts on MPϕ/16
RAPI_MP64	Internal clock: counts on MPϕ/64
RAPI_MP256_1	Internal clock: counts on MPϕ/256 (for channel 1)
RAPI_MP256_34	Internal clock: counts on MPϕ/256 (for channel 3 or 4)
RAPI_MP1024_2	Internal clock: counts on MPϕ/1024 (for channel 2)
RAPI_MP1024_34	Internal clock: counts on MPϕ/1024 (for channel 3 or 4)
RAPI_P8	Internal clock: counts on Pϕ/8
RAPI_P32	Internal clock: counts on Pϕ/32
RAPI_P128	Internal clock: counts on Pϕ/128
RAPI_P512	Internal clock: counts on Pϕ/512
RAPI_FREE_RUNNING	Free-running count operation
RAPI_PERIODIC	Periodic count operation
RAPI_RISING_EDGE	Counts at rising edge
RAPI_FALLING_EDGE	Counts at falling edge
RAPI_BOTH_EDGE	Counts at both edges
Note: When MPϕ/1 is specified for the count source, count edge is fixed to rising edge.	

Description (2/7)

RAPI_TCNT_CLEAR_DIS	Disables TCNT clearing (selectable only in TGRE and TGRF of channel 0)
RAPI_TCNT_CLEAR_TGRA	Clears TCNT by TGRA compare match
RAPI_TCNT_CLEAR_TGRB	Clears TCNT by TGRB compare match
RAPI_TCNT_CLEAR_TGRC	Clears TCNT by TGRC compare match
RAPI_TCNT_CLEAR_TGRD	Clears TCNT by TGRD compare match
RAPI_TCNT_CLEAR_DIS_TGRE	Uses TGRE register, but disables TCNT clearing by TGRE compare match
RAPI_TCNT_CLEAR_DIS_TGRF	Uses TGRF register, but disables TCNT clearing by TGRF compare match
RAPI_TCNT_CLEAR_TGRU	Clears TCNT by TGRU_5 compare match
RAPI_TCNT_CLEAR_TGRV	Clears TCNT by TGRV_5 compare match
RAPI_TCNT_CLEAR_TGRW	Clears TCNT by TGRW_5 compare match
RAPI_OUTPUT_RETAIN	Output retained
RAPI_OUTPUT_0_0	Initial output is 0, and outputs 0at compare match
RAPI_OUTPUT_0_1	Initial output is 0, and outputs 1 at compare match
RAPI_OUTPUT_0_TOG	Initial output is 0, and outputs toggle at compare match
RAPI_OUTPUT_1_0	Initial output is 1, and outputs 0 at compare match
RAPI_OUTPUT_1_1	Initial output is 1, and outputs 1 at compare match
RAPI_OUTPUT_1_TOG	Initial output is 1, and outputs toggle at compare match
RAPI_OVERFLOW_ENA	Enables overflow interrupt
RAPI_OVERFLOW_DIS	Disables overflow interrupt
RAPI_COMPARE_MATCH_ENA	Enables compare match interrupt
RAPI_COMPARE_MATCH_DIS	Disables compare match interrupt
RAPI_AD_START_REQ	Enables generation of A/D converter start requests by TGRA input capture/compare match
RAPI_NO_AD_START_REQ	Disables generation of A/D converter start requests by TGRA input capture/compare match
RAPI_TIMER_INT_LV_0	Interrupt priority level 0
RAPI_TIMER_INT_LV_1	Interrupt priority level 1
RAPI_TIMER_INT_LV_2	Interrupt priority level 2
RAPI_TIMER_INT_LV_3	Interrupt priority level 3
RAPI_TIMER_INT_LV_4	Interrupt priority level 4
RAPI_TIMER_INT_LV_5	Interrupt priority level 5
RAPI_TIMER_INT_LV_6	Interrupt priority level 6
RAPI_TIMER_INT_LV_7	Interrupt priority level 7
RAPI_TIMER_INT_LV_8	Interrupt priority level 8
RAPI_TIMER_INT_LV_9	Interrupt priority level 9
RAPI_TIMER_INT_LV_10	Interrupt priority level 10
RAPI_TIMER_INT_LV_11	Interrupt priority level 11
RAPI_TIMER_INT_LV_12	Interrupt priority level 12
RAPI_TIMER_INT_LV_13	Interrupt priority level 13
RAPI_TIMER_INT_LV_14	Interrupt priority level 14
RAPI_TIMER_INT_LV_15	Interrupt priority level 15

Description (3/7)

• Selectable parameters when RAPI_MTU2_0 is specified:

(Count source) Specify one from { RAPI_MP1, RAPI_MP4, RAPI_MP16, RAPI_MP64 }. The default value is RAPI_MP1.

(Operation method) Specify one from { RAPI_FREE_RUNNING, RAPI_PERIODIC }. The default value is RAPI_FREE_RUNNING.

(Count edge) Specify one from { RAPI_FALLING_EDGE, RAPI_RISING_EDGE, RAPI_BOTH_EDGE }. The default value is RAPI_RISING_EDGE.
Note: When RAPI_MP1 is specified for the count source, count edge is fixed to the default value.

• When RAPI_FREE_RUNNING is selected, the following parameters can be set:

(Interrupt enable) Specify one from { RAPI_OVERFLOW_ENA, RAPI_OVERFLOW_DIS }. The default value is RAPI_OVERFLOW_DIS.

(Interrupt priority level) Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }. The default value is RAPI_TIMER_INT_LV_0.

• When RAPI_PERIODIC is selected, the following parameters can be set:

(Count clearing source) Specify one from { RAPI_TCNT_CLEAR_DIS, RAPI_TCNT_CLEAR_TGRA, RAPI_TCNT_CLEAR_TGRB, RAPI_TCNT_CLEAR_TGRC, RAPI_TCNT_CLEAR_TGRD, RAPI_TCNT_CLEAR_DIS_TGRE, RAPI_TCNT_CLEAR_DIS_TGRF }. The default value is RAPI_TCNT_CLEAR_DIS.

(Count output) Specify one from { RAPI_OUTPUT_RETAIN, RAPI_OUTPUT_0_0, RAPI_OUTPUT_0_1, RAPI_OUTPUT_0_TOG, RAPI_OUTPUT_1_0, RAPI_OUTPUT_1_1, RAPI_OUTPUT_1_TOG }. The default value is RAPI_OUTPUT_RETAIN.

(A/D converter start request) Specify one from { RAPI_AD_START_REQ, RAPI_NO_AD_START_REQ }. The default value is RAPI_NO_AD_START_REQ.

(Interrupt enable) Specify one from { RAPI_COMPARE_MATCH_ENA, RAPI_COMPARE_MATCH_DIS }. The default value is RAPI_COMPARE_MATCH_DIS.

(Interrupt priority level) Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }. The default value is RAPI_TIMER_INT_LV_0.

Description (4/7)

• Selectable parameters when RAPI_MTU2_1 is specified:

(Count source) Specify one from { RAPI_MP1, RAPI_MP4, RAPI_MP16, RAPI_MP64, RAPI_MP256_1 }.
The default value is RAPI_MP1.

(Operation method) Specify one from { RAPI_FREE_RUNNING, RAPI_PERIODIC }.
The default value is RAPI_FREE_RUNNING.

(Count edge) Specify one from { RAPI_RISING_EDGE, RAPI_FALLING_EDGE, RAPI_BOTH_EDGE }.
The default value is RAPI_RISING_EDGE.
Note: When RAPI_MP1 is specified for the count source, count edge is fixed to the default value.

• When RAPI_FREE_RUNNING is selected, the following parameters can be set:

(Interrupt enable) Specify one from { RAPI_OVERFLOW_ENA, RAPI_OVERFLOW_DIS }.
The default value is RAPI_OVERFLOW_DIS.

(Interrupt priority level) Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }.
The default value is RAPI_TIMER_INT_LV_0.

• When RAPI_PERIODIC is selected, the following parameters can be set:

(Count clearing source) Specify one from { RAPI_ TCNT_CLEAR_TGRA, RAPI_ TCNT_CLEAR_TGRB }.
The default value is RAPI_TCNT_CLEAR_DIS.

(Count output) Specify one from { RAPI_OUTPUT_RETAIN, RAPI_OUTPUT_0_0, RAPI_OUTPUT_0_1, RAPI_OUTPUT_0_TOG, RAPI_OUTPUT_1_0, RAPI_OUTPUT_1_1, RAPI_OUTPUT_1_TOG }.
The default value is RAPI_OUTPUT_RETAIN.

(A/D converter start request) Specify one from { RAPI_AD_START_REQ, RAPI_NO_AD_START_REQ }.
The default value is RAPI_NO_AD_START_REQ.

(Interrupt enable) Specify one from { RAPI_COMPARE_MATCH_ENA, RAPI_COMPARE_MATCH_DIS }.
The default value is RAPI_COMPARE_MATCH_DIS.

(Interrupt priority level) Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }.
The default value is RAPI_TIMER_INT_LV_0.

Description (5/7)

• Selectable parameters when RAPI_MTU2_2 is specified:

(Count source) Specify one from { RAPI_MP1, RAPI_MP4, RAPI_MP16, RAPI_MP64, RAPI_MP1024_2 }.
The default value is RAPI_MP1.

(Operation method) Specify one from { RAPI_FREE_RUNNING, RAPI_PERIODIC }.
The default value is RAPI_FREE_RUNNING.

(Count edge) Specify one from { RAPI_RISING_EDGE, RAPI_FALLING_EDGE, RAPI_BOTH_EDGE }.
The default value is RAPI_RISING_EDGE.
Note: When RAPI_MP1 is specified for the count source, count edge is fixed to the default value.

• When RAPI_FREE_RUNNING is selected, the following parameters can be set:

(Interrupt enable) Specify one from { RAPI_OVERFLOW_ENA, RAPI_OVERFLOW_DIS }.
The default value is RAPI_OVERFLOW_DIS.

(Interrupt priority level) Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }.
The default value is RAPI_TIMER_INT_LV_0.

• When RAPI_PERIODIC is selected, the following parameters can be set:

(Count clearing source) Specify one from { RAPI_ TCNT_CLEAR_TGRA, RAPI_ TCNT_CLEAR_TGRB }.
The default value is RAPI_TCNT_CLEAR_DIS.

(Count output) Specify one from { RAPI_OUTPUT_RETAIN, RAPI_OUTPUT_0_0, RAPI_OUTPUT_0_1, RAPI_OUTPUT_0_TOG, RAPI_OUTPUT_1_0, RAPI_OUTPUT_1_1, RAPI_OUTPUT_1_TOG }.
The default value is RAPI_OUTPUT_RETAIN.

(A/D converter start request) Specify one from { RAPI_AD_START_REQ, RAPI_NO_AD_START_REQ }.
The default value is RAPI_NO_AD_START_REQ.

(Interrupt enable) Specify one from { RAPI_COMPARE_MATCH_ENA, RAPI_COMPARE_MATCH_DIS }.
The default value is RAPI_COMPARE_MATCH_DIS.

(Interrupt priority level) Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }.
The default value is RAPI_TIMER_INT_LV_0.

Description (6/7)

• Selectable parameters when RAPI_MTU2_3 or RAPI_MTU2_4 is specified:

(Count source) Specify one from { RAPI_MP1, RAPI_MP4, RAPI_MP16, RAPI_MP64, RAPI_MP256_34, RAPI_MP1024_34 }. The default value is RAPI_MP1.

(Operation method) Specify one from { RAPI_FREE_RUNNING, RAPI_PERIODIC }. The default value is RAPI_FREE_RUNNING.

(Count edge) Specify one from { RAPI_RISING_EDGE, RAPI_FALLING_EDGE, RAPI_BOTH_EDGE }. The default value is RAPI_RISING_EDGE.
Note: When RAPI_MP1 is specified for the count source, count edge is fixed to the default value.

• When RAPI_FREE_RUNNING is selected, the following parameters can be set:

(Interrupt enable) Specify one from { RAPI_OVERFLOW_ENA, RAPI_OVERFLOW_DIS }. The default value is RAPI_OVERFLOW_DIS.

(Interrupt priority level) Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }. The default value is RAPI_TIMER_INT_LV_0.

• When RAPI_PERIODIC is selected, the following parameters can be set:

(Count clearing source) Specify one from { RAPI_ TCNT_CLEAR_TGRA, RAPI_TCNT_CLEAR_TGRB, RAPI_TCNT_CLEAR_TGRC, RAPI_TCNT_CLEAR_TGRD }. The default value is RAPI_ TCNT_CLEAR_DIS.

(Count output) Specify one from { RAPI_OUTPUT_RETAIN, RAPI_OUTPUT_0_0, RAPI_OUTPUT_0_1, RAPI_OUTPUT_0_TOG, RAPI_OUTPUT_1_0, RAPI_OUTPUT_1_1, RAPI_OUTPUT_1_TOG }. The default value is RAPI_OUTPUT_RETAIN.

(A/D converter start request) Specify one from { RAPI_AD_START_REQ, RAPI_NO_AD_START_REQ }. The default value is RAPI_NO_AD_START_REQ.

(Interrupt enable) Specify one from { RAPI_COMPARE_MATCH_ENA, RAPI_COMPARE_MATCH_DIS }. The default value is RAPI_COMPARE_MATCH_DIS.

(Interrupt priority level) Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }. The default value is RAPI_TIMER_INT_LV_0.

Description (7/7)

• Selectable parameters when RAPI_MTU2_5 is specified:

(Count source)	Specify one from { RAPI_MP1, RAPI_MP4, RAPI_MP16, RAPI_MP64 }. The default value is RAPI_MP1.
(Operation method)	Only RAPI_PERIODIC can be selected.
(Count clearing source)	Specify one from { RAPI_TCNT_CLEAR_DIS, RAPI_TCNT_CLEAR_TGRU, RAPI_TCNT_CLEAR_TGRV, RAPI_TCNT_CLEAR_TGRW }. The default value is RAPI_TCNT_CLEAR_DIS.
(Interrupt enable)	Specify one from { RAPI_COMPARE_MATCH_ENA, RAPI_COMPARE_MATCH_DIS }. The default value is RAPI_COMPARE_MATCH_DIS.
(Interrupt priority level)	Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }. The default value is RAPI_TIMER_INT_LV_0.

• Selectable parameters when RAPI_CMT_0 or RAPI_CMT_1 is specified:

(Channel)	Specify one from { RAPI_CMT_0, RAPI_CMT_1 }.
(Count source)	Specify one from { RAPI_P8, RAPI_P32, RAPI_P128, RAPI_P512 }. The default value is RAPI_MP8.
(Interrupt enable)	Specify one from { RAPI_COMPARE_MATCH_ENA, RAPI_COMPARE_MATCH_DIS }. The default value is RAPI_COMPARE_MATCH_DIS.
(Interrupt priority level)	Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }. The default value is RAPI_TIMER_INT_LV_0.

[data2]
For data2, set 16-bit value to the timer general register (TGR).

[func]
For func, specify a pointer to callback function. If this pointer is not specified, set RAPI_NULL.

Return value

If the specification of timer is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

Timer MTU2 (timer mode)

Reference

__EnableTimer, __DestroyTimer

Remark

If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_timer_sh_7125.h"

/* Declaration of callback function */
void TimerIntFunc( void );

void func( void )
{
   /* Setting MTU2 channel 0 for timer mode */
   __CreateTimer( RAPI_MTU2_0 | RAPI_MP16 | RAPI_PERIODIC |
          RAPI_RISING_EDGE | RAPI_TCNT_CLEAR_TGRA |
          RAPI_OUTPUT_0_TOG | RAPI_NO_AD_START_REQ |
          RAPI_COMPARE_MATCH_ENA | RAPI_TIMER_INT_LV_5,
          0x8000, TimerIntFunc );
}
```

2) __EnableTimer

Synopsis

<Operation control for timer mode>
Boolean __EnableTimer(unsigned long data)

data	Setup data

Description

Controls start/stop operation of the specified timer in timer mode.

[data]
For data, set the following parameters. To set multiple parameters of channels, use the symbol "|" to separate each specified parameter. Then several timers can be enabled or disabled at the same time. (Refer to notes below.)

RAPI_MTU2_0	MTU2 channel 0
RAPI_MTU2_1	MTU2 channel 1
RAPI_MTU2_2	MTU2 channel 2
RAPI_MTU2_3	MTU2 channel 3
RAPI_MTU2_4	MTU2 channel 4
RAPI_MTU20_4	MTU2 channels 0 to 4
RAPI_MTU2_5U	MTU2 channel 5U
RAPI_MTU2_5V	MTU2 channel 5V
RAPI_MTU2_5W	MTU2 channel 5W
RAPI_MTU2_5	MTU2 channels 5U, 5V, and 5W
RAPI_CMT_0	CMT channel 0
RAPI_CMT_1	CMT channel 1
RAPI_CMT_ALL	CMT all channels
RAPI_TIMER_ON	Starts the timer in timer mode
RAPI_TIMER_OFF	Stops the timer in timer mode

Notes:
- For RAPI_MTU2_0 to 4, several channels can be specified at the same time.
- For RAPI_MTU2_5U, 5V and 5W, several channels can be specified at the same time.
- For RAPI_CMT_0 and 1, several channels can be specified at the same time.

Return value

If the specification of timer is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

Timer MTU2 (timer mode)

Reference

__CreateTimer, __DestroyTimer

Remark

If an undefined value is specified in the argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_timer_sh_7125.h"

void func( void )
{
   /* Start-up timer for MTU2 channels 0 and 1 in timer mode */
   __EnableTimer( RAPI_MTU2_0 | RAPI_MTU2_1 | RAPI_TIMER_ON );
}
```

3) __DestroyTimer

Synopsis

<Clearing of setting for timer mode>
Boolean __DestroyTimer(unsigned long data)

data	Setup data

Description

Clears setting of the specified timer in timer mode.

[data]
For data, set the following parameters. To set multiple parameters, use the symbol "|" to separate each specified parameter. Then several settings of timers can be cleared at the same time.

RAPI_MTU2_0	MTU2 channel 0
RAPI_MTU2_1	MTU2 channel 1
RAPI_MTU2_2	MTU2 channel 2
RAPI_MTU2_3	MTU2 channel 3
RAPI_MTU2_4	MTU2 channel 4
RAPI_MTU20_4	MTU2 channels 0 to 4
RAPI_MTU2_5U	MTU2 channel 5U
RAPI_MTU2_5V	MTU2 channel 5V
RAPI_MTU2_5W	MTU2 channel 5W
RAPI_MTU2_5	MTU2 channels 5U, 5V, and 5W
RAPI_MTU2_ALL	MTU2 all channels
RAPI_CMT_0	CMT channel 0
RAPI_CMT_1	CMT channel 1
RAPI_CMT_ALL	CMT all channels
RAPI_TIMER_ALL	all MTU2 and CMT channels

Return value

If the specification of timer is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

Timer MTU2 (timer mode)

Reference

__CreateTimer, __EnableTimer

Remark

If an undefined value is specified in the argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_timer_sh_7125.h"

void func( void )
{
    /* Clearing settings of MTU2 channels 2 and 3
       in timer mode */
    __DestroyTimer( RAPI_MTU2_2 | RAPI_MTU2_3 );
}
```

4) __CreateEventCounter

Synopsis

<Setting for event counter mode>

Boolean __CreateEventCounter(unsigned long data1, unsigned short data2, void *func1, void *func2)

data1	Setup data 1
data2	Setup data 2
func1	Pointer to callback function for compare match interrupt or overflow interrupt
func2	Pointer to callback function for underflow interrupt

Description (1/7)

Sets the specified timer to event counter mode.

[data1]

For data1, set the following parameters. To set multiple parameters at the same time, use the symbol "|" to separate each specified parameter.

RAPI_MTU2_0	MTU2 channel 0
RAPI_MTU2_1	MTU2 channel 1
RAPI_MTU2_2	MTU2 channel 2
RAPI_MTU2_3	MTU2 channel 3
RAPI_MTU2_4	MTU2 channel 4
RAPI_EXTER_TCLKA_0	External clock: counts on TCLKA pin input (for channel 0, 1, or 2)
RAPI_EXTER_TCLKB_0	External clock: counts on TCLKB pin input (for channel 0, 1, or 2)
RAPI_EXTER_TCLKC_0	External clock: counts on TCLKC pin input (for channel 0 or 2)
RAPI_EXTER_TCLKD_0	External clock: counts on TCLKD pin input (for channel 0)
RAPI_EXTER_TCLKA_3	External clock: counts on TCLKA pin input (for channel 3 or 4)
RAPI_EXTER_TCLKB_3	External clock: counts on TCLKB pin input (for channel 3 or 4)
RAPI_TCNT2_FLOW	Counts on TCNT_2 overflow/underflow
RAPI_NORMAL	Normal mode
RAPI_PHASE_COUNTING_1	Phase counting mode 1 (only for channel 1 or 2)
RAPI_PHASE_COUNTING_2	Phase counting mode 2 (only for channel 1 or 2)
RAPI_PHASE_COUNTING_3	Phase counting mode 3 (only for channel 1 or 2)
RAPI_PHASE_COUNTING_4	Phase counting mode 4 (only for channel 1 or 2)
RAPI_FREE_RUNNING	Free-running count operation
RAPI_PERIODIC	Periodic count operation
RAPI_RISING_EDGE	Counts at rising edge
RAPI_FALLING_EDGE	Counts at falling edge
RAPI_BOTH_EDGE	Counts at both edges
Note: When TCNT_2 overflow/underflow is specified for the count source, count edge is fixed to rising edge.	
RAPI_TCNT_CLEAR_DIS	Disables TCNT clearing (selectable only in TGRE and TGRF of channel 0)
RAPI_TCNT_CLEAR_TGRA	Clears TCNT by TGRA compare match
RAPI_TCNT_CLEAR_TGRB	Clears TCNT by TGRB compare match
RAPI_TCNT_CLEAR_TGRC	Clears TCNT by TGRC compare match
RAPI_TCNT_CLEAR_TGRD	Clears TCNT by TGRD compare match

Description (2/7)

RAPI_OUTPUT_RETAIN	Output retained
RAPI_OUTPUT_0_0	Initial output is 0, and outputs 0 at compare match
RAPI_OUTPUT_0_1	Initial output is 0, and outputs 1 at compare match
RAPI_OUTPUT_0_TOG	Initial output is 0, and outputs toggle at compare match
RAPI_OUTPUT_1_0	Initial output is 1, and outputs 0 at compare match
RAPI_OUTPUT_1_1	Initial output is 1, and outputs 1 at compare match
RAPI_OUTPUT_1_TOG	Initial output is 1, and outputs toggle at compare match
RAPI_OVERFLOW_ENA	Enables overflow interrupt
RAPI_OVERFLOW_DIS	Disables overflow interrupt
RAPI_COMPARE_MATCH_ENA	Enables compare match interrupt
RAPI_COMPARE_MATCH_DIS	Disables compare match interrupt
RAPI_UNDERFLOW_ENA	Enables underflow interrupt (selectable only when channel 1 or 2 is set in phase counting mode)
RAPI_UNDERFLOW_DIS	Disables underflow interrupt (selectable only when channel 1 or 2 is set in phase counting mode)
RAPI_AD_START_REQ	Enables generation of A/D converter start requests by TGRA input capture/compare match
RAPI_NO_AD_START_REQ	Disables generation of A/D converter start requests by TGRA input capture/compare match
RAPI_TIMER_INT_LV_0	Interrupt priority level 0
RAPI_TIMER_INT_LV_1	Interrupt priority level 1
RAPI_TIMER_INT_LV_2	Interrupt priority level 2
RAPI_TIMER_INT_LV_3	Interrupt priority level 3
RAPI_TIMER_INT_LV_4	Interrupt priority level 4
RAPI_TIMER_INT_LV_5	Interrupt priority level 5
RAPI_TIMER_INT_LV_6	Interrupt priority level 6
RAPI_TIMER_INT_LV_7	Interrupt priority level 7
RAPI_TIMER_INT_LV_8	Interrupt priority level 8
RAPI_TIMER_INT_LV_9	Interrupt priority level 9
RAPI_TIMER_INT_LV_10	Interrupt priority level 10
RAPI_TIMER_INT_LV_11	Interrupt priority level 11
RAPI_TIMER_INT_LV_12	Interrupt priority level 12
RAPI_TIMER_INT_LV_13	Interrupt priority level 13
RAPI_TIMER_INT_LV_14	Interrupt priority level 14
RAPI_TIMER_INT_LV_15	Interrupt priority level 15

Description (3/7)

• Selectable parameters when RAPI_MTU2_0 and RAPI_NORMAL are specified:

(Count source) Specify one from { RAPI_EXTER_TCLKA_0, RAPI_EXTER_TCLKB_0, RAPI_EXTER_TCLKC_0, RAPI_EXTER_TCLKD_0 }.

(Operating method) Specify one from { RAPI_FREE_RUNNING, RAPI_PERIODIC }. The default value is RAPI_FREE_RUNNING.

(Count edge) Specify one from { RAPI_RISING_EDGE, RAPI_FALLING_EDGE, RAPI_BOTH_EDGE }. The default value is RAPI_RISING_EDGE.

• When RAPI_FREE_RUNNING is selected, the following parameters can be set:

(Interrupt enable) Specify one from { RAPI_OVERFLOW_ENA, RAPI_OVERFLOW_DIS }. The default value is RAPI_OVERFLOW_DIS.

(Interrupt priority level) Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }. The default value is RAPI_TIMER_INT_LV_0.

• When RAPI_PERIODIC is selected, the following parameters can be set:

(Count clearing source) Specify one from { RAPI_TCNT_CLEAR_TGRA, RAPI_TCNT_CLEAR_TGRB, RAPI_TCNT_CLEAR_TGRC, RAPI_TCNT_CLEAR_TGRD, RAPI_TCNT_CLEAR_OTHER }.

(Count output) Specify one from { RAPI_OUTPUT_RETAIN, RAPI_OUTPUT_0_0, RAPI_OUTPUT_0_1, RAPI_OUTPUT_0_TOG, RAPI_OUTPUT_1_0, RAPI_OUTPUT_1_1, RAPI_OUTPUT_1_TOG }. The default value is RAPI_OUTPUT_RETAIN.

(A/D converter start request) Specify one from { RAPI_AD_START_REQ, RAPI_NO_AD_START_REQ }. The default value is RAPI_NO_AD_START_REQ.

(Interrupt enable) Specify one from { RAPI_COMPARE_MATCH_ENA, RAPI_COMPARE_MATCH_DIS }. The default value is RAPI_COMPARE_MATCH_DIS.

(Interrupt priority level) Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }. The default value is RAPI_TIMER_INT_LV_0.

Description (4/7)

• Selectable parameters when RAPI_MTU2_1 and RAPI_NORMAL are specified:

(Count source) Specify one from { RAPI_EXTER_TCLKA_0, RAPI_EXTER_TCLKB_0, RAPI_TCNT2_FLOW }.

(Operation method) Specify one from { RAPI_FREE_RUNNING, RAPI_PERIODIC }.
The default value is RAPI_FREE_RUNNING.

(Count edge) Specify one from { RAPI_RISING_EDGE, RAPI_FALLING_EDGE, RAPI_BOTH_EDGE }.
The default value is RAPI_RISING_EDGE.
Note: When RAPI_TNCT2_FLOW is specified for the count source, count edge is fixed to the default value.

• When RAPI_FREE_RUNNING is selected, the following parameters can be set:

(Interrupt enable) Specify one from { RAPI_OVERFLOW_ENA, RAPI_OVERFLOW_DIS }.
The default value is RAPI_OVERFLOW_DIS.

(Interrupt priority level) Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }.
The default value is RAPI_TIMER_INT_LV_0.

• When RAPI_PERIODIC is selected, the following parameters can be set:

(Count clearing source) Specify one from { RAPI_TCNT_CLEAR_TGRA, RAPI_TCNT_CLEAR_TGRB, RAPI_TCNT_CLEAR_OTHER }.

(Count output) Specify one from { RAPI_OUTPUT_RETAIN, RAPI_OUTPUT_0_0, RAPI_OUTPUT_0_1, RAPI_OUTPUT_0_TOG, RAPI_OUTPUT_1_0, RAPI_OUTPUT_1_1, RAPI_OUTPUT_1_TOG }.
The default value is RAPI_OUTPUT_RETAIN.

(A/D converter start request) Specify one from { RAPI_AD_START_REQ, RAPI_NO_AD_START_REQ }.
The default value is RAPI_NO_AD_START_REQ.

(Interrupt enable) Specify one from { RAPI_COMPARE_MATCH_ENA, RAPI_COMPARE_MATCH_DIS }.
The default value is RAPI_COMPARE_MATCH_DIS.

(Interrupt priority level) Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }.
The default value is RAPI_TIMER_INT_LV_0.

Description (5/7)

• Selectable parameters when RAPI_MTU2_2 and RAPI_NORMAL are specified:

(Count source) Specify one from { RAPI_EXTER_TCLKA_0, RAPI_EXTER_TCLKB_0, RAPI_EXTER_TCLKC_0 }.

(Operation method) Specify one from { RAPI_FREE_RUNNING, RAPI_PERIODIC }.
The default value is RAPI_FREE_RUNNING.

(Count edge) Specify one from { RAPI_RISING_EDGE, RAPI_FALLING_EDGE, RAPI_BOTH_EDGE }.
The default value is RAPI_RISING_EDGE.
Note: When RAPI_TCNT2_FLOW is specified for the count source, count edge is fixed to the default value.

• When RAPI_FREE_RUNNING is selected, the following parameters can be set:

(Interrupt enable) Specify one from { RAPI_OVERFLOW_ENA, RAPI_OVERFLOW_DIS }.
The default value is RAPI_OVERFLOW_DIS.

(Interrupt priority level) Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }.
The default value is RAPI_TIMER_INT_LV_0.

• When RAPI_PERIODIC is selected, the following parameters can be set:

(Count clearing source) Specify one from { RAPI_TCNT_CLEAR_TGRA, RAPI_TCNT_CLEAR_TGRB, RAPI_TCNT_CLEAR_OTHER }.

(Count output) Specify one from { RAPI_OUTPUT_RETAIN, RAPI_OUTPUT_0_0, RAPI_OUTPUT_0_1, RAPI_OUTPUT_0_TOG, RAPI_OUTPUT_1_0, RAPI_OUTPUT_1_1, RAPI_OUTPUT_1_TOG }.
The default value is RAPI_OUTPUT_RETAIN.

(A/D converter start request) Specify one from { RAPI_AD_START_REQ, RAPI_NO_AD_START_REQ }.
The default value is RAPI_NO_AD_START_REQ.

(Interrupt enable) Specify one from { RAPI_COMPARE_MATCH_ENA, RAPI_COMPARE_MATCH_DIS }.
The default value is RAPI_COMPARE_MATCH_DIS.

(Interrupt priority level) Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }.
The default value is RAPI_TIMER_INT_LV_0.

Description (6/7)

- **Selectable parameters when "RAPI_MTU2_3 or RAPI_MTU2_4" and RAPI_NORMAL are specified:**

(Count source) Specify one from { RAPI_EXTER_TCLKA_3, RAPI_EXTER_TCLKB_3 }.

(Operation method) Specify one from { RAPI_FREE_RUNNING, RAPI_PERIODIC }. The default value is RAPI_FREE_RUNNING.

(Count edge) Specify one from { RAPI_RISING_EDGE, RAPI_FALLING_EDGE, RAPI_BOTH_EDGE }. The default value is RAPI_RISING_EDGE.

• When RAPI_FREE_RUNNING is selected, the following parameters can be set:

(Interrupt enable) Specify one from { RAPI_OVERFLOW_ENA, RAPI_OVERFLOW_DIS }. The default value is RAPI_OVERFLOW_DIS.

(Interrupt priority level) Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }. The default value is RAPI_TIMER_INT_LV_0.

• When RAPI_PERIODIC is selected, the following parameters can be set:

(Count clearing source) Specify one from { RAPI_TCNT_CLEAR_TGRA, RAPI_TCNT_CLEAR_TGRB, RAPI_TCNT_CLEAR_TGRC, RAPI_TCNT_CLEAR_TGRD, RAPI_TCNT_CLEAR_OTHER }.

(Count output) Specify one from { RAPI_OUTPUT_RETAIN, RAPI_OUTPUT_0_0, RAPI_OUTPUT_0_1, RAPI_OUTPUT_0_TOG, RAPI_OUTPUT_1_0, RAPI_OUTPUT_1_1, RAPI_OUTPUT_1_TOG }. The default value is RAPI_OUTPUT_RETAIN.

(A/D converter start request) Specify one from { RAPI_AD_START_REQ, RAPI_NO_AD_START_REQ }. The default value is RAPI_NO_AD_START_REQ.

(Interrupt enable) Specify one from { RAPI_COMPARE_MATCH_ENA, RAPI_COMPARE_MATCH_DIS }. The default value is RAPI_COMPARE_MATCH_DIS.

(Interrupt priority level) Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }. The default value is RAPI_TIMER_INT_LV_0.

Description (7/7)

- **Selectable parameters when "RAPI_MTU2_1 or RAPI_MTU2_2" and "RAPI_PHASE_COUNTING_1, RAPI_PHASE_COUNTING_2, RAPI_PHASE_COUNTING_3 or RAPI_PHASE_COUNTING_4" are specified:**

(Channel)	Specify one from { RAPI_MTU2_1, RAPI_MTU2_2 }.
(Interrupt enable)	Specify one from { RAPI_OVERFLOW_ENA, RAPI_OVERFLOW_DIS }, and/or one from { RAPI_UNDERFLOW_ENA, RAPI_UNDERFLOW_DIS }. The default values are RAPI_OVERFLOW_DIS and RAPI_UNDERFLOW_DIS respectively.
(Interrupt priority level)	Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }. The default value is RAPI_TIMER_INT_LV_0.

[data2]
For data2, set 16-bit value to the timer general register (TGR).

[func1]
For func1, specify a pointer to callback function. This callback function is for compare match interrupt or overflow interrupt in normal event counter mode. If not specifying the callback function, set RAPI_NULL.

[func2]
For func2, specify a pointer to callback function. This callback function is for underflow interrupt in phase counting mode. If this pointer is not specified, set RAPI_NULL.

Return value

If the specification of timer is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

Timer MTU2 (event counter mode)

Reference

__EnableEventCounter, __DestroyEventCounter, __GetTimerCounter

Remark

If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_timer_sh_7125.h"

/* Declaration of callback function */
void TimerIntFunc( void );

void func( void )
{
   /* Setting MTU2 channel 0 for event counter mode */
   __CreateEventCounter( RAPI_MTU2_0 | RAPI_EXTER_TCLKA_0 |
          RAPI_PERIODIC | RAPI_RISING_EDGE | RAPI_TCNT_CLEAR_TGRA |
          RAPI_OUTPUT_RETAIN | RAPI_COMPARE_MATCH_ENA |
          RAPI_TIMER_INT_LV_5, 0x8000, TimerIntFunc, RAPI_NULL );
}
```

5) __EnableEventCounter

Synopsis

<Operation control for event counter mode>

Boolean __EnableEventCounter(unsigned long data)

data	Setup data

Description

Controls start/stop operation of the specified timer in the event counter mode.

[data]

For data, set the following parameters. To set multiple parameters, use the symbol "|" to separate each specified parameter. Then several timers can be enabled or disabled at the same time.

RAPI_MTU2_0	MTU2 channel 0
RAPI_MTU2_1	MTU2 channel 1
RAPI_MTU2_2	MTU2 channel 2
RAPI_MTU2_3	MTU2 channel 3
RAPI_MTU2_4	MTU2 channel 4
RAPI_MTU20_4	MTU2 channels 0 to 4
RAPI_TIMER_ON	Starts the timer in event counter mode
RAPI_TIMER_OFF	Stops the timer in event counter mode

Return value

If the specification of timer is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

Timer MTU2 (event counter mode)

Reference

__EnableTimer

Remark

If an undefined value is specified in the argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_timer_sh_7125.h"

void func( void )
{
    /* Start-up timer for MTU2 channels 0 and 1 in event counter mode */
    __EnableEventCounter( RAPI_MTU2_0 | RAPI_MTU2_1 | RAPI_TIMER_ON );
}
```

6) __DestroyEventCounter

Synopsis

<Clearing of setting for event counter mode>

Boolean __DestroyEventCounter(unsigned long data)

data	Setup data

Description

Clears setting of the specified timer in the event counter mode.

[data]

For data, set the following parameters. To set multiple parameters, use the symbol "|" to separate each specified parameter. Then several settings of timers can be cleared at the same time.

RAPI_MTU2_0	MTU2 channel 0
RAPI_MTU2_1	MTU2 channel 1
RAPI_MTU2_2	MTU2 channel 2
RAPI_MTU2_3	MTU2 channel 3
RAPI_MTU2_4	MTU2 channel 4
RAPI_MTU20_4	MTU2 channels 0 to 4

Return value

If the specification of timer is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

Timer MTU2 (event counter mode)

Reference

__DestroyTimer

Remark

If an undefined value is specified in the argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_timer_sh_7125.h"

void func( void )
{
    /* Clearing settings of MTU2 channels 1 and 2
       in event counter mode */
    __DestroyEventCounter( RAPI_MTU2_1 | RAPI_MTU2_2 );
}
```

7) __GetTimerCounter

Synopsis

<Acquisition of counter value in timer mode or event counter mode>

Boolean __GetTimerCounter(unsigned long data1, unsigned short *data2)

data1	Setup data 1
data2	Setup data 2

Description

Acquires the counter value of the specified timer in timer mode or event counter mode.

[data1]

For data1, set the following parameters. To set multiple parameters of channels, use the symbol "|" to separate each specified parameter. Then counter values of several timers can be obtained at the same time. (Refer to notes below.)

RAPI_MTU2_0	MTU2 channel 0 (TCNT_0)
RAPI_MTU2_1	MTU2 channel 1 (TCNT_1)
RAPI_MTU2_2	MTU2 channel 2 (TCNT_2)
RAPI_MTU2_3	MTU2 channel 3 (TCNT_3)
RAPI_MTU2_4	MTU2 channel 4 (TCNT_4)
RAPI_MTU20_4	MTU2 channels 0 to 4
RAPI_MTU2_5U	MTU2 channel 5 (TCNTU_5)
RAPI_MTU2_5V	MTU2 channel 5 (TCNTV_5)
RAPI_MTU2_5W	MTU2 channel 5 (TCNTW_5)
RAPI_MTU2_5	MTU2 channels 5U, 5V, and 5W
RAPI_CMT_0	CMT channel 0 (CMCNT_0)
RAPI_CMT_1	CMT channel 1 (CMCNT_1)
RAPI_CMT_ALL	CMT all channels

• Selectable parameters when timer mode is selected:

(Count channel) Specify one from { RAPI_MTU2_0, RAPI_MTU2_1, RAPI_MTU2_2, RAPI_MTU2_3, RAPI_MTU2_4, RAPI_MTU2_5U, RAPI_MTU2_5V, RAPI_MTU2_5W, RAPI_CMT_0, RAPI_CMT_1 }.

Notes:
- For MTU2 channels 0 to 5, several channels can be specified at the same time.
- For CMT channels 0 and 1, several channels can be specified at the same time.

• Selectable parameters when event counter mode is selected:

(Count channel) Specify one from { RAPI_MTU2_0, RAPI_MTU2_1, RAPI_MTU2_2, RAPI_MTU2_3, RAPI_MTU2_4 }.

[data2]

For data2, specify a pointer to a buffer storing the timer counter value.

Return value

If the specification of timer is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

Timer MTU2 (timer mode / event counter mode)

Reference

__CreateTimer

Remark

If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_timer_sh_7125.h"

void func( void )
{
   unsigned short data[2];

   /* Acquisition of counter value of MTU2 channels 0 and 1 */
   __GetTimerCounter( RAPI_MTU2_0 | RAPI_MTU2_1, data );
}
```

8) __CreatePWM

Synopsis

<Setting for pulse width modulation mode>

Boolean __CreatePWM(unsigned long data, void *func)

data	Setup data
func	Pointer to callback function

Description (1/6)

Sets the specified timer to pulse width modulation mode.

[data]

For data, set the following parameters. To set multiple parameters at the same time, use the symbol "|" to separate each specified parameter.

RAPI_MTU2_0	MTU2 channel 0
RAPI_MTU2_1	MTU2 channel 1
RAPI_MTU2_2	MTU2 channel 2
RAPI_MTU2_3	MTU2 channel 3
RAPI_MTU2_4	MTU2 channel 4
RAPI_MP1	Internal clock: counts on MPϕ/1
RAPI_MP4	Internal clock: counts on MPϕ/4
RAPI_MP16	Internal clock: counts on MPϕ/16
RAPI_MP64	Internal clock: counts on MPϕ/64
RAPI_MP256_1	Internal clock: counts on MPϕ/256 (for channel 1)
RAPI_MP256_34	Internal clock: counts on MPϕ/256 (for channel 3 or 4)
RAPI_MP1024_2	Internal clock: counts on MPϕ/1024 (for channel 2)
RAPI_MP1024_34	Internal clock: counts on MPϕ/1024 (for channel 3 or 4)
RAPI_EXTER_TCLKA_0	External clock: counts on TCLKA pin input (for channel 0 to 2)
RAPI_EXTER_TCLKB_0	External clock: counts on TCLKB pin input (for channel 0 to 2)
RAPI_EXTER_TCLKC_0	External clock: counts on TCLKC pin input (for channel 0 or 2)
RAPI_EXTER_TCLKD_0	External clock: counts on TCLKD pin input (for channel 0)
RAPI_EXTER_TCLKA_3	External clock: counts on TCLKA pin input (for channel 3 or 4)
RAPI_EXTER_TCLKB_3	External clock: counts on TCLKB pin input (for channel 3 or 4)
RAPI_RISING_EDGE	Counts at rising edge
RAPI_FALLING_EDGE	Counts at falling edge
RAPI_BOTH_EDGE	Counts at both edges
Note: When MPϕ/1 is specified as the count source, count edge is fixed to rising edge.	

Description (2/6)

RAPI_PWM_MODE1	PWM mode 1
RAPI_PWM_MODE2	PWM mode 2 (only for channel 0, 1, or 2)
RAPI_TCNT_CLEAR_DIS	Disables TCNT clearing
RAPI_TCNT_CLEAR_TGRA	Clears TCNT by TGRA compare match
RAPI_TCNT_CLEAR_TGRB	Clears TCNT by TGRB compare match
RAPI_TCNT_CLEAR_TGRC	Clears TCNT by TGRC compare match
RAPI_TCNT_CLEAR_TGRD	Clears TCNT by TGRD compare match
RAPI_TCNT_CLEAR_OTHER	Clears TCNT by counter clearing during synchronously clearing/operating for another channel
RAPI_OVERFLOW_ENA	Enables overflow interrupt
RAPI_OVERFLOW_DIS	Disables overflow interrupt
RAPI_AD_START_REQ	Enables generation of A/D converter start requests by TGRA input capture/compare match
RAPI_NO_AD_START_REQ	Disables generation of A/D converter start requests by TGRA input capture/compare match
RAPI_TIMER_INT_LV_0	Interrupt priority level 0
RAPI_TIMER_INT_LV_1	Interrupt priority level 1
RAPI_TIMER_INT_LV_2	Interrupt priority level 2
RAPI_TIMER_INT_LV_3	Interrupt priority level 3
RAPI_TIMER_INT_LV_4	Interrupt priority level 4
RAPI_TIMER_INT_LV_5	Interrupt priority level 5
RAPI_TIMER_INT_LV_6	Interrupt priority level 6
RAPI_TIMER_INT_LV_7	Interrupt priority level 7
RAPI_TIMER_INT_LV_8	Interrupt priority level 8
RAPI_TIMER_INT_LV_9	Interrupt priority level 9
RAPI_TIMER_INT_LV_10	Interrupt priority level 10
RAPI_TIMER_INT_LV_11	Interrupt priority level 11
RAPI_TIMER_INT_LV_12	Interrupt priority level 12
RAPI_TIMER_INT_LV_13	Interrupt priority level 13
RAPI_TIMER_INT_LV_14	Interrupt priority level 14
RAPI_TIMER_INT_LV_15	Interrupt priority level 15
RAPI_TIMER_SYNC	Synchronizes operation for channels 0 to 4
RAPI_TIMER_NO_SYNC	Does not synchronize operation for channels 0 to 4

Description (3/6)

• Selectable parameters when RAPI_MTU2_0 is specified:

(Count source)	Specify one from { RAPI_MP_1, RAPI_MP_4, RAPI_MP_16 RAPI_MP_64, RAPI_EXTER_TCLKA_0, RAPI_EXTER_TCLKB_0, RAPI_EXTER_TCLKC_0, RAPI_EXTER_TCLKD_0 }. The default value is RAPI_MP_1.
(Count edge)	Specify one from { RAPI_RISING_EDGE, RAPI_FALLING_EDGE, RAPI_BOTH_EDGE }. The default value is RAPI_RISING_EDGE. Note: When RAPI_MP1 is specified for the count source, count edge is fixed to the default value.
(Operating mode)	Specify one from { RAPI_PWM_MODE1, RAPI_PWM_MODE2 }.
(Count clearing source)	Specify one from { RAPI_TCNT_CLEAR_DIS, RAPI_TCNT_CLEAR_TGRA, RAPI_TCNT_CLEAR_TGRB, RAPI_TCNT_CLEAR_TGRC, RAPI_TCNT_CLEAR_TGRD, RAPI_TCNT_CLEAR_OTHER }. The default value is RAPI_TCNT_CLEAR_DIS.
(A/D converter start request)	Specify one from { RAPI_AD_START_REQ, RAPI_NO_AD_START_REQ }. The default value is RAPI_NO_AD_START_REQ.
(Interrupt enable)	Specify one from { RAPI_OVERFLOW_ENA, RAPI_OVERFLOW_DIS }. The default value is RAPI_OVERFLOW_DIS.
(Interrupt priority level)	Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }. The default value is RAPI_TIMER_INT_LV_0.

Description (4/6)

• Selectable parameters when RAPI_MTU2_1 is specified:

(Count source)	Specify one from { RAPI_MP_1, RAPI_MP_4, RAPI_MP_16 RAPI_MP_64, RAPI_MP_256_1, RAPI_EXTER_TCLKA_0, RAPI_EXTER_TCLKB_0 }. The default value is RAPI_MP_1.
(Count edge)	Specify one from { RAPI_RISING_EDGE, RAPI_FALLING_EDGE, RAPI_BOTH_EDGE }. The default value is RAPI_RISING_EDGE. Note: When RAPI_MP1 is specified for the count source, count edge is fixed to the default value.
(Operating mode)	Specify one from { RAPI_PWM_MODE1, RAPI_PWM_MODE2 }.
(Count clearing source)	Specify one from { RAPI_TCNT_CLEAR_DIS, RAPI_TCNT_CLEAR_TGRA, RAPI_TCNT_CLEAR_TGRB, RAPI_TCNT_CLEAR_OTHER }. The default value is RAPI_TCNT_CLEAR_DIS.
(A/D converter start request)	Specify one from { RAPI_AD_START_REQ, RAPI_NO_AD_START_REQ }. The default value is RAPI_NO_AD_START_REQ.
(Interrupt enable)	Specify one from { RAPI_OVERFLOW_ENA, RAPI_OVERFLOW_DIS }. The default value is RAPI_OVERFLOW_DIS.
(Interrupt priority level)	Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }. The default value is RAPI_TIMER_INT_LV_0.

Description (5/6)

• Selectable parameters when RAPI_MTU2_2 is specified:

(Count source)	Specify one from { RAPI_MP_1, RAPI_MP_4, RAPI_MP_16 RAPI_MP_64, RAPI_MP_1024_2, RAPI_EXTER_TCLKA_0, RAPI_EXTER_TCLKB_0, RAPI_EXTER_TCLKC_0 }. The default value is RAPI_MP_1.
(Count edge)	Specify one from { RAPI_RISING_EDGE, RAPI_FALLING_EDGE, RAPI_BOTH_EDGE }. The default value is RAPI_RISING_EDGE. Note: When RAPI_MP1 is specified for the count source, count edge is fixed to the default value.
(Operating mode)	Specify one from { RAPI_PWM_MODE1, RAPI_PWM_MODE2 }.
(Count clearing source)	Specify one from { RAPI_TCNT_CLEAR_DIS, RAPI_TCNT_CLEAR_TGRA, RAPI_TCNT_CLEAR_TGRB, RAPI_TCNT_CLEAR_OTHER }. The default value is RAPI_TCNT_CLEAR_DIS.
(A/D converter start request)	Specify one from { RAPI_AD_START_REQ, RAPI_NO_AD_START_REQ }. The default value is RAPI_NO_AD_START_REQ.
(Interrupt enable)	Specify one from { RAPI_OVERFLOW_ENA, RAPI_OVERFLOW_DIS }. The default value is RAPI_OVERFLOW_DIS.
(Interrupt priority level)	Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }. The default value is RAPI_TIMER_INT_LV_0.

Description (6/6)

• Selectable parameters when RAPI_MTU2_3 or RAPI_MTU2_4 is specified: (only for PWM mode 1 (RAPI_PWM_MODE1))

(Count source)	Specify one from { RAPI_MP_1, RAPI_MP_4, RAPI_MP_16 RAPI_MP_64, RAPI_MP_256_34, RAPI_MP_1024_34, RAPI_EXTER_TCLKA_3, RAPI_EXTER_TCLKB_3 }. The default value is RAPI_MP_1.
(Count edge)	Specify one from { RAPI_RISING_EDGE, RAPI_FALLING_EDGE, RAPI_BOTH_EDGE }. The default value is RAPI_RISING_EDGE. Note: When RAPI_MP1 is specified for the count source, count edge is fixed to the default value.
(Count clearing source)	Specify one from { RAPI_TCNT_CLEAR_DIS, RAPI_TCNT_CLEAR_TGRA, RAPI_TCNT_CLEAR_TGRB, RAPI_TCNT_CLEAR_TGRC, RAPI_TCNT_CLEAR_TGRD, RAPI_TCNT_CLEAR_OTHER }. The default value is RAPI_TCNT_CLEAR_DIS.
(A/D converter start request)	Specify one from { RAPI_AD_START_REQ, RAPI_NO_AD_START_REQ }. The default value is RAPI_NO_AD_START_REQ.
(Interrupt enable)	Specify one from { RAPI_OVERFLOW_ENA, RAPI_OVERFLOW_DIS }. The default value is RAPI_OVERFLOW_DIS.
(Interrupt priority level)	Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }. The default value is RAPI_TIMER_INT_LV_0.

• Parameters when synchronous operation is specified:
When setting synchronous operation for any channels 0 to 4, specify RAPI_TIMER_SYNC.
When not setting synchronous operation (each channel operates independently), specify RAPI_TIMER_NO_SYNC.
The default value is RAPI_TIMER_NO_SYNC.

[func]
For func, specify a pointer to callback function. If this pointer is not specified, set RAPI_NULL.

Return value

If the specification of timer is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

Timer MTU2 (pulse width modulation mode)

Reference

__EnablePWM, __DestroyPWM

Remark

If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_timer_sh_7125.h"

/* Declaration of callback function */
void TimerIntFunc( void );

void func( void )
{
   /* Setting MTU2 channel 1 for pulse width modulation mode */
   __CreatePWM( RAPI_MTU2_1 | RAPI_MP_4 | RAPI_RISING_EDGE |
          RAPI_PWM_MODE1 | RAPI_TCNT_CLEAR_TGRB | RAPI_OVERFLOW_DIS |
          RAPI_TIMER_INT_LV_0 | RAPI_TIMER_NO_SYNC, TimerIntFunc);
}
```

9) __SetPWMPin

Synopsis

<Setting of timer general register for pulse width modulation>

Boolean __SetPWMPin(unsigned long data1, unsigned short data2, void *func)

data1	Setup data 1
data2	Setup data 2
func	Pointer to callback function

Description (1/2)

Sets the timer general register of the specified channel for pulse width modulation.

[data1]

For data1, set the following parameters. To set multiple parameters at the same time, use the symbol "|" to separate each specified parameter.

RAPI_MTU2_0	MTU2 channel 0
RAPI_MTU2_1	MTU2 channel 1
RAPI_MTU2_2	MTU2 channel 2
RAPI_MTU2_3	MTU2 channel 3
RAPI_MTU2_4	MTU2 channel 4
RAPI_TGRA	Timer General Register A
RAPI_TGRB	Timer General Register B
RAPI_TGRC	Timer General Register C
RAPI_TGRD	Timer General Register D
RAPI_OUTPUT_RETAIN	Output retained
RAPI_OUTPUT_0_0	Initial output is 0, and outputs 0 at compare match
RAPI_OUTPUT_0_1	Initial output is 0, and outputs 1 at compare match
RAPI_OUTPUT_0_TOG	Initial output is 0, and outputs toggle at compare match
RAPI_OUTPUT_1_0	Initial output is 1, and outputs 0 at compare match
RAPI_OUTPUT_1_1	Initial output is 1, and outputs 1 at compare match
RAPI_OUTPUT_1_TOG	Initial output is 1, and outputs toggle at compare match
RAPI_COMPARE_MATCH_ENA	Enables compare match interrupt
RAPI_COMPARE_MATCH_DIS	Disables compare match interrupt
RAPI_TIMER_INT_LV_0	Interrupt priority level 0
RAPI_TIMER_INT_LV_1	Interrupt priority level 1
RAPI_TIMER_INT_LV_2	Interrupt priority level 2
RAPI_TIMER_INT_LV_3	Interrupt priority level 3
RAPI_TIMER_INT_LV_4	Interrupt priority level 4
RAPI_TIMER_INT_LV_5	Interrupt priority level 5
RAPI_TIMER_INT_LV_6	Interrupt priority level 6
RAPI_TIMER_INT_LV_7	Interrupt priority level 7
RAPI_TIMER_INT_LV_8	Interrupt priority level 8
RAPI_TIMER_INT_LV_9	Interrupt priority level 9
RAPI_TIMER_INT_LV_10	Interrupt priority level 10
RAPI_TIMER_INT_LV_11	Interrupt priority level 11
RAPI_TIMER_INT_LV_12	Interrupt priority level 12
RAPI_TIMER_INT_LV_13	Interrupt priority level 13
RAPI_TIMER_INT_LV_14	Interrupt priority level 14
RAPI_TIMER_INT_LV_15	Interrupt priority level 15

Description (2/2)

- **Selectable parameters when RAPI_MTU2_0, RAPI_MTU2_3, or RAPI_MTU2_4 is specified:**

(Timer general register)	Specify one from { RAPI_TGRA, RAPI_TGRB, RAPI_TGRC, RAPI_TGRD }.
(Count output)	Specify one from { RAPI_OUTPUT_RETAIN, RAPI_OUTPUT_0_0, RAPI_OUTPUT_0_1, RAPI_OUTPUT_0_TOG, RAPI_OUTPUT_1_0, RAPI_OUTPUT_1_1, RAPI_OUTPUT_1_TOG }. The default value is RAPI_OUTPUT_RETAIN.
(Interrupt enable)	Specify one from { RAPI_COMPARE_MATCH_ENA, RAPI_COMPARE_MATCH_DIS }. The default value is RAPI_COMPARE_MATCH_DIS.
(Interrupt priority level)	Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }. The default value is RAPI_TIMER_INT_LV_0.

- **Selectable parameters when RAPI_MTU2_1 or RAPI_MTU2_2 is specified:**

(Timer general register)	Specify one from { RAPI_TGRA, RAPI_TGRB }.
(Count output)	Specify one from { RAPI_OUTPUT_RETAIN, RAPI_OUTPUT_0_0, RAPI_OUTPUT_0_1, RAPI_OUTPUT_0_TOG, RAPI_OUTPUT_1_0, RAPI_OUTPUT_1_1, RAPI_OUTPUT_1_TOG }. The default value is RAPI_OUTPUT_RETAIN.
(Interrupt enable)	Specify one from { RAPI_COMPARE_MATCH_ENA, RAPI_COMPARE_MATCH_DIS }. The default value is RAPI_COMPARE_MATCH_DIS.
(Interrupt priority level)	Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }. The default value is RAPI_TIMER_INT_LV_0.

[data2]
For data2, set the 16-bit counter value for duty register or cycle register.
Note: The duty register value is smaller than the cycle register value.
(TGRA and TGRB are pair in PWM mode 1, so are TGRC and TGRD.
In PWM mode 2, one is cycle register, others are duty registers.)

[func]
For func, specify a pointer to callback function. If this pointer is not specified, set RAPI_NULL. If retaining the callback function that is already specified, set RAPI_HOLD. Then only value in data2 is changed.

Return value

If the specification of channel is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

Timer MTU2 (pulse width modulation mode)

Reference

__EnablePWM, __DestroyPWM

Remark

If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_timer_sh_7125.h"

/* Declaration of callback function */
void TimerIntBFunc(void);
void TimerIntAFunc(void);

void func( void )
{
   /* Setting TGRB (TGRB_1) in MTU2 channel 1 for cycle register */
   __SetPWMPin( RAPI_MTU2_1 | RAPI_TGRB | RAPI_OUTPUT_0_0 |
          RAPI_COMPARE_MATCH_ENA | RAPI_TIMER_INT_LV_3,
          50000, TimerIntBFunc );
   /* Setting TGRA (TGRA_1) in MTU2 channel 1 for duty register */
   __SetPWMPin( RAPI_MTU2_1 | RAPI_TGRA | RAPI_OUTPUT_0_1 |
          RAPI_COMPARE_MATCH_ENA | RAPI_TIMER_INT_LV_3,
          30000, TimerIntAFunc );
}
```

10) __EnablePWM

Synopsis

<Operation control for pulse width modulation mode>

Boolean __EnablePWM(unsigned long data)

data	Setup data

Description

Controls start/stop operation of the specified timer in pulse width modulation mode.

[data]

For data, set the following parameters. To set multiple parameters, use the symbol "|" to separate each specified parameter. Then several timers can be enabled or disabled at the same time.

RAPI_MTU2_0	MTU2 channel 0
RAPI_MTU2_1	MTU2 channel 1
RAPI_MTU2_2	MTU2 channel 2
RAPI_MTU2_3	MTU2 channel 3
RAPI_MTU2_4	MTU2 channel 4
RAPI_MTU20_4	MTU2 channels 0 to 4
RAPI_TIMER_ON	Starts the timer in pulse width modulation mode
RAPI_TIMER_OFF	Stops the timer in pulse width modulation mode

Return value

If the specification of timer is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

Timer MTU2 (pulse width modulation mode)

Reference

__CreatePWM, __DestroyPWM

Remark

If an undefined value is specified in the argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_timer_sh_7125.h"

void func( void )
{
    /* Start-up timer for MTU2 channels 1 and 2
       in pulse width modulation mode */
    __EnablePWM( RAPI_MTU2_1 | RAPI_MTU2_2 | RAPI_TIMER_ON );
}
```

11) __DestroyPWM

Synopsis

<Clearing of setting for pulse width modulation mode>

Boolean __DestroyPWM(unsigned long data)

data	Setup data

Description

Clears setting of the specified timer in pulse width modulation mode.

[data]

For data, set the following parameters. To set multiple parameters, use the symbol "|" to separate each specified parameter. Then several settings of timers can be cleared at the same time.

RAPI_MTU2_0	MTU2 channel 0
RAPI_MTU2_1	MTU2 channel 1
RAPI_MTU2_2	MTU2 channel 2
RAPI_MTU2_3	MTU2 channel 3
RAPI_MTU2_4	MTU2 channel 4
RAPI_MTU20_4	MTU2 channels 0 to 4

Return value

If the specification of timer is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

Timer MTU2 (pulse width modulation mode)

Reference

__CreatePWM, __EnablePWM

Remark

If an undefined value is specified in the argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_timer_sh_7125.h"

void func( void )
{
    /* Clearing settings of MTU2 channels 1 and 2
       in pulse width modulation mode */
    __DestroyPWM( RAPI_MTU2_1 | RAPI_MTU2_2 );
}
```

12) __CreatePulsePeriodMeasurementMode

Synopsis

<Setting for pulse period measurement mode>

Boolean __CreatePulsePeriodMeasurementMode(unsigned long data, void *func)

data	Setup data
func	Pointer to callback function

Description (1/5)

Sets the specified timer in pulse period measurement mode.

[data]

For data, set the following parameters. To set multiple parameters at the same time, use the symbol "|" to separate each specified parameter.

RAPI_MTU2_0	MTU2 channel 0
RAPI_MTU2_1	MTU2 channel 1
RAPI_MTU2_2	MTU2 channel 2
RAPI_MTU2_3	MTU2 channel 3
RAPI_MTU2_4	MTU2 channel 4
RAPI_MTU2_5U	MTU2 channel 5U
RAPI_MTU2_5V	MTU2 channel 5V
RAPI_MTU2_5W	MTU2 channel 5W
RAPI_MP_1	Internal clock: counts on MPϕ/1
RAPI_MP_4	Internal clock: counts on MPϕ/4
RAPI_MP_16	Internal clock: counts on MPϕ/16
RAPI_MP_64	Internal clock: counts on MPϕ/64
RAPI_MP_256_1	Internal clock: counts on MPϕ/256 (for channel 1)
RAPI_MP_256_34	Internal clock: counts on MPϕ/256 (for channel 3 or 4)
RAPI_MP_1024_2	Internal clock: counts on MPϕ/1024 (for channel 2)
RAPI_MP_1024_34	Internal clock: counts on MPϕ/1024 (for channel 3 or 4)
RAPI_RISING_EDGE	Counts at rising edge
RAPI_FALLING_EDGE	Counts at falling edge
RAPI_BOTH_EDGE	Counts at both edges
Note: When MPϕ/1 is specified for the count source, count edge is fixed to rising edge.	
RAPI_AD_START_REQ	Enables generation of A/D converter start requests by TGRA input capture/compare match
RAPI_NO_AD_START_REQ	Disables generation of A/D converter start requests by TGRA input capture/compare match
RAPI_TCNT_CLEAR_DIS	Disables TCNT clearing
RAPI_TCNT_CLEAR_TGRA	Clears TCNT by TGRA input capture
RAPI_TCNT_CLEAR_TGRB	Clears TCNT by TGRB input capture
RAPI_TCNT_CLEAR_TGRC	Clears TCNT by TGRC input capture
RAPI_TCNT_CLEAR_TGRD	Clears TCNT by TGRD input capture
RAPI_TCNT_CLEAR_TGRU	Clears TCNT by TGRU input capture
RAPI_TCNT_CLEAR_TGRV	Clears TCNT by TGRV input capture
RAPI_TCNT_CLEAR_TGRW	Clears TCNT by TGRW input capture

Description (2/5)

RAPI_OVERFLOW_ENA	Enables overflow interrupt
RAPI_OVERFLOW_DIS	Disables overflow interrupt
RAPI_TIMER_INT_LV_0	Interrupt priority level 0
RAPI_TIMER_INT_LV_1	Interrupt priority level 1
RAPI_TIMER_INT_LV_2	Interrupt priority level 2
RAPI_TIMER_INT_LV_3	Interrupt priority level 3
RAPI_TIMER_INT_LV_4	Interrupt priority level 4
RAPI_TIMER_INT_LV_5	Interrupt priority level 5
RAPI_TIMER_INT_LV_6	Interrupt priority level 6
RAPI_TIMER_INT_LV_7	Interrupt priority level 7
RAPI_TIMER_INT_LV_8	Interrupt priority level 8
RAPI_TIMER_INT_LV_9	Interrupt priority level 9
RAPI_TIMER_INT_LV_10	Interrupt priority level 10
RAPI_TIMER_INT_LV_11	Interrupt priority level 11
RAPI_TIMER_INT_LV_12	Interrupt priority level 12
RAPI_TIMER_INT_LV_13	Interrupt priority level 13
RAPI_TIMER_INT_LV_14	Interrupt priority level 14
RAPI_TIMER_INT_LV_15	Interrupt priority level 15

- **Selectable parameters when RAPI_MTU2_0 is specified:**

(Count source) Specify one from { RAPI_MP_1, RAPI_MP_4, RAPI_MP_16, RAPI_MP_64 }.
The default value is RAPI_MP_1.

(Count edge) Specify one from { RAPI_RISING_EDGE, RAPI_FALLING_EDGE, RAPI_BOTH_EDGE }.
The default value is RAPI_RISING_EDGE.
Note: When RAPI_MP1 is specified for the count source, count edge is fixed to the default value.

(Count clearing source) Specify one from { RAPI_TCNT_CLEAR_DIS, RAPI_TCNT_CLEAR_TGRA, RAPI_TCNT_CLEAR_TGRB, RAPI_TCNT_CLEAR_TGRC, RAPI_TCNT_CLEAR_TGRD }.
The default value is RAPI_TCNT_CLEAR_DIS.

(A/D converter start request) Specify one from { RAPI_AD_START_REQ, RAPI_NO_AD_START_REQ }.
The default value is RAPI_NO_AD_START_REQ.

(Interrupt enable) Specify one from { RAPI_OVERFLOW_ENA, RAPI_OVERFLOW_DIS }.
The default value is RAPI_OVERFLOW_DIS.

(Interrupt priority level) Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }.
The default value is RAPI_TIMER_INT_LV_0.

Description (3/5)

- **Selectable parameters when RAPI_MTU2_1 is specified:**

(Count source)	Specify one from { RAPI_MP_1, RAPI_MP_4, RAPI_MP_16, RAPI_MP_64, RAPI_MP_256_1 }. The default value is RAPI_MP_1.
(Count edge)	Specify one from { RAPI_RISING_EDGE, RAPI_FALLING_EDGE, RAPI_BOTH_EDGE }. The default value is RAPI_RISING_EDGE. Note: When RAPI_MP1 is specified for the count source, count edge is fixed to the default value.
(Count clearing source)	Specify one from { RAPI_TCNT_CLEAR_DIS, RAPI_TCNT_CLEAR_TGRA, RAPI_TCNT_CLEAR_TGRB }. The default value is RAPI_TCNT_CLEAR_DIS.
(A/D converter start request)	Specify one from { RAPI_AD_START_REQ, RAPI_NO_AD_START_REQ }. The default value is RAPI_NO_AD_START_REQ.
(Interrupt enable)	Specify one from { RAPI_OVERFLOW_ENA, RAPI_OVERFLOW_DIS }. The default value is RAPI_OVERFLOW_DIS.
(Interrupt priority level)	Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }. The default value is RAPI_TIMER_INT_LV_0.

Description (4/5)

- **Selectable parameters when RAPI_MTU2_2 is specified:**

(Count source)	Specify one from { RAPI_MP_1, RAPI_MP_4, RAPI_MP_16, RAPI_MP_64, RAPI_MP_1024_2 }. The default value is RAPI_MP_1.
(Count edge)	Specify one from { RAPI_RISING_EDGE, RAPI_FALLING_EDGE, RAPI_BOTH_EDGE }. The default value is RAPI_RISING_EDGE. Note: When RAPI_MP1 is specified for the count source, count edge is fixed to the default value.
(Count clearing source)	Specify one from { RAPI_TCNT_CLEAR_DIS, RAPI_TCNT_CLEAR_TGRA, RAPI_TCNT_CLEAR_TGRB }. The default value is RAPI_TCNT_CLEAR_DIS.
(A/D converter start request)	Specify one from { RAPI_AD_START_REQ, RAPI_NO_AD_START_REQ }. The default value is RAPI_NO_AD_START_REQ.
(Interrupt enable)	Specify one from { RAPI_OVERFLOW_ENA, RAPI_OVERFLOW_DIS }. The default value is RAPI_OVERFLOW_DIS.
(Interrupt priority level)	Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }. The default value is RAPI_TIMER_INT_LV_0.

Description (5/5)

- **Selectable parameters when RAPI_MTU2_3 or RAPI_MTU2_4 is specified:**

(Count source) Specify one from { RAPI_MP_1, RAPI_MP_4, RAPI_MP_16, RAPI_MP_64, RAPI_MP_256_34, RAPI_MP_1024_34 }. The default value is RAPI_MP_1.

(Count edge) Specify one from { RAPI_RISING_EDGE, RAPI_FALLING_EDGE, RAPI_BOTH_EDGE }. The default value is RAPI_RISING_EDGE.
Note: When RAPI_MP1 is specified for the count source, count edge is fixed to the default value.

(Count clearing source) Specify one from { RAPI_TCNT_CLEAR_DIS, RAPI_TCNT_CLEAR_TGRA, RAPI_TCNT_CLEAR_TGRB, RAPI_TCNT_CLEAR_TGRC, RAPI_TCNT_CLEAR_TGRD }. The default value is RAPI_TCNT_CLEAR_DIS.

(A/D converter start request) Specify one from { RAPI_AD_START_REQ, RAPI_NO_AD_START_REQ }. The default value is RAPI_NO_AD_START_REQ.

(Interrupt enable) Specify one from { RAPI_OVERFLOW_ENA, RAPI_OVERFLOW_DIS }. The default value is RAPI_OVERFLOW_DIS.

(Interrupt priority level) Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }. The default value is RAPI_TIMER_INT_LV_0.

- **Selectable parameters when RAPI_MTU2_5 is specified:**

(Count source) Specify one from { RAPI_MP_1, RAPI_MP_4, RAPI_MP_16, RAPI_MP_64 }. The default value is RAPI_MP_1.

(Count edge) Specify one from { RAPI_RISING_EDGE, RAPI_FALLING_EDGE, RAPI_BOTH_EDGE }. The default value is RAPI_RISING_EDGE.
Note: When RAPI_MP1 is specified for the count source, count edge is fixed to the default value.

(Count clearing source) Specify one from { RAPI_TCNT_CLEAR_DIS, RAPI_TCNT_CLEAR_TGRU, RAPI_TCNT_CLEAR_TGRV, RAPI_TCNT_CLEAR_TGRW }. The default value is RAPI_TCNT_CLEAR_DIS.

[func]
For func, specify a pointer to callback function. If this pointer is not specified, set RAPI_NULL.

Return value

If the specification of timer is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

Timer MTU2 (pulse period measurement mode)

Reference

__CreateInputCapture

Remark

If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_timer_sh_7125.h"

/* Declaration of callback function */
void TimerIntFunc( void );

void func( void )
{
   /* Setting MTU2 channel 4 for pulse period measurement mode */
   __CreatePulsePeriodMeasurementMode( RAPI_MTU2_4 | RAPI_MP_4 |
          RAIP_RISING_EDGE | RAPI_TCNT_CLEAR_DIS | RAPI_OVERFLOW_ENA |
          RAPI_TIMER_INT_LV_1, TimerIntFunc );
}
```

13) __SetInputPeriodPin

Synopsis

<Setting of input pin for pulse period measurement>

Boolean __SetInputPeriodPin(unsigned long data, void *func)

data	Setup data
func	Pointer to callback function

Description (1/3)

Sets the specified pin to input pin for pulse period measurement.

[data]

For data, set the following parameters. To set multiple parameters at the same time, use the symbol "|" to separate each specified parameter.

RAPI_MTU2_0	MTU2 channel 0
RAPI_MTU2_1	MTU2 channel 1
RAPI_MTU2_2	MTU2 channel 2
RAPI_MTU2_3	MTU2 channel 3
RAPI_MTU2_4	MTU2 channel 4
RAPI_MTU2_5U	MTU2 channel 5U
RAPI_MTU2_5V	MTU2 channel 5V
RAPI_MTU2_5W	MTU2 channel 5W
RAPI_TIOCA	TIOC*i*A pin (*i* = 0 to 4)
RAPI_TIOCB	TIOC*i*B pin (*i* = 0 to 4)
RAPI_TIOCC	TIOC*i*C pin (*i* = 0, 3, or 4)
RAPI_TIOCD	TIOC*i*D pin (*i* = 0, 3, or 4)
RAPI_RISING_CAP_0	Input capture at rising edge for channel 0 to 4
RAPI_FALLING_CAP_0	Input capture at falling edge for channel 0 to 4
RAPI_RISING_CAP_5	Input capture at rising edge for channel 5
RAPI_FALLING_CAP_5	Input capture at falling edge for channel 5
RAPI_CAPTURE_ENA	Enables TGR*i* input capture interrupt (*i* = A, B, C, D, U, V, or W)
RAPI_CAPTURE_DIS	Disables input capture interrupt
RAPI_TIMER_INT_LV_0	Interrupt priority level 0
RAPI_TIMER_INT_LV_1	Interrupt priority level 1
RAPI_TIMER_INT_LV_2	Interrupt priority level 2
RAPI_TIMER_INT_LV_3	Interrupt priority level 3
RAPI_TIMER_INT_LV_4	Interrupt priority level 4
RAPI_TIMER_INT_LV_5	Interrupt priority level 5
RAPI_TIMER_INT_LV_6	Interrupt priority level 6
RAPI_TIMER_INT_LV_7	Interrupt priority level 7
RAPI_TIMER_INT_LV_8	Interrupt priority level 8
RAPI_TIMER_INT_LV_9	Interrupt priority level 9
RAPI_TIMER_INT_LV_10	Interrupt priority level 10
RAPI_TIMER_INT_LV_11	Interrupt priority level 11
RAPI_TIMER_INT_LV_12	Interrupt priority level 12
RAPI_TIMER_INT_LV_13	Interrupt priority level 13
RAPI_TIMER_INT_LV_14	Interrupt priority level 14
RAPI_TIMER_INT_LV_15	Interrupt priority level 15

Description (2/3)

- **Selectable parameters when RAPI_MTU2_0, RAPI_MTU2_3, or RAPI_MTU2_4 is specified:**

  (Capture channel) Specify one from { RAPI_TIOCA, RAPI_TIOCB, RAPI_TIOCC, RAPI_TIOCD }.

  (Capture edge) Specify one from { RAPI_RISING_CAP_0, RAPI_FALLING_CAP_0 }.

  (Interrupt enable) Specify one from { RAPI_CAPTURE_ENA, RAPI_CAPTURE_DIS }.
  The default value is RAPI_CAPTURE_DIS.

  (Interrupt priority level) Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }.
  The default value is RAPI_TIMER_INT_LV_0.

- **Selectable parameters when RAPI_MTU2_1 or RAPI_MTU2_2 is specified:**

  (Capture channel) Specify one from { RAPI_TIOCA, RAPI_TIOCB }.

  (Capture edge) Specify one from { RAPI_RISING_CAP_0, RAPI_FALLING_CAP_0 }.

  (Interrupt enable) Specify one from { RAPI_CAPTURE_ENA, RAPI_CAPTURE_DIS }
  The default value is RAPI_CAPTURE_DIS.

  (Interrupt priority level) Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }.
  The default value is RAPI_TIMER_INT_LV_0.

- **Selectable parameters when RAPI_MTU2_5 is specified:**

  (Capture channel) Specify one from { RAPI_MTU2_5U, RAPI_MTU2_5V, RAPI_MTU2_5W }.

  (Capture edge) Specify one from { RAPI_RISING_CAP_5, RAPI_FALLING_CAP_5 }.

  (Interrupt enable) Specify one from { RAPI_CAPTURE_ENA, RAPI_CAPTURE_DIS }
  The default value is RAPI_CAPTURE_DIS.

  (Interrupt priority level) Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }.
  The default value is RAPI_TIMER_INT_LV_0.

Description (3/3)

[func]
For func, specify a pointer to callback function. If this pointer is not specified, set RAPI_NULL.

Return value

If the specification of timer is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

Timer MTU2 (pulse period measurement mode)

Reference

__SetInputCapturePin

Remark

If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_timer_sh_7125.h"

void TimerIntFunc( void );

void func( void )
{
   /* Setting TGRA for MTU2 channel 0 as input capture pin */
   __SetInputPeriodPin( RAPI_MTU2_0 | RAPI_TIOCA |
          RAPI_RISING_CAP_0 | RAPI_CAPTURE_ENA |
          RAPI_TIMER_INT_LV_3, TimerIntFunc );
}
```

14) __EnablePulsePeriodMeasurementMode

Synopsis

<Operation control for pulse period measurement mode>
Boolean __EnablePulsePeriodMeasurementMode(unsigned long data)

data	Setup data

Description

Controls start/stop operation of the specified timer in pulse period measurement mode.

[data]
For data, set the following parameters. To set multiple parameters, use the symbol "|" to separate each specified parameter. Then several timers can be enabled or disabled at the same time.

RAPI_MTU2_0	MTU2 channel 0
RAPI_MTU2_1	MTU2 channel 1
RAPI_MTU2_2	MTU2 channel 2
RAPI_MTU2_3	MTU2 channel 3
RAPI_MTU2_4	MTU2 channel 4
RAPI_MTU2_5U	MTU2 channel 5U
RAPI_MTU2_5V	MTU2 channel 5V
RAPI_MTU2_5W	MTU2 channel 5W
RAPI_TIMER_ON	Starts the timer in pulse period measurement mode
RAPI_TIMER_OFF	Stops the timer in pulse period measurement mode

Return value

If the specification of timer is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

Timer MTU2 (pulse period measurement mode)

Reference

__EnableInputCapture

Remark

If an undefined value is specified in the argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_timer_sh_7125.h"

void func( void )
{
    /* Start-up timer for MTU2 channel 4
       in pulse period measurement mode */
    __EnablePulsePeriodMeasurementMode( RAPI_MTU2_4 | RAPI_TIMER_ON );
}
```

15) __DestroyPulsePeriodMeasurementMode

Synopsis

<Clearing of setting for pulse period measurement mode>
Boolean __DestroyPulsePeriodMeasurementMode(unsigned long data)

data	Setup data

Description

Clears setting of the specified timer in pulse period measurement mode.

[data]
For data, set the following parameters. To set multiple parameters, use the symbol "|" to separate each specified parameter. Then several settings of timers can be cleared at the same time.

RAPI_MTU2_0	MTU2 channel 0
RAPI_MTU2_1	MTU2 channel 1
RAPI_MTU2_2	MTU2 channel 2
RAPI_MTU2_3	MTU2 channel 3
RAPI_MTU2_4	MTU2 channel 4
RAPI_MTU20_4	MTU2 channels 0 to 4
RAPI_MTU2_5U	MTU2 channel 5U
RAPI_MTU2_5V	MTU2 channel 5V
RAPI_MTU2_5W	MTU2 channel 5W
RAPI_MTU2_5	MTU2 channels 5U, 5V, and 5W
RAPI_MTU2_ALL	All MTU2 channels

Return value

If the specification of timer is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

Timer MTU2 (pulse period measurement mode)

Reference

__DestroyInputCapture

Remark

If an undefined value is specified in the argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_timer_sh_7125.h"

void func( void )
{
    /* Clearing setting of MTU2 channel 4
       in pulse period measurement mode */
    __DestroyPulsePeriodMeasurementMode( RAPI_MTU2_4 );
}
```

16) __GetPulsePeriodMeasurementMode

Synopsis

<Acquisition of measured value in pulse period measurement mode>
Boolean __GetPulsePeriodMeasurementMode(unsigned long data1, unsigned short *data2)

data1	Setup data 1
data2	Pointer to the buffer storing the counter value

Description

Acquires the counter value of the specified timer in pulse period measurement mode.

[data1]
For data1, set the following parameters. To set multiple parameters, use the symbol "|" to separate each specified parameter. Then several pins can be selected at the same time.

RAPI_MTU2_0	MTU2 channel 0
RAPI_MTU2_1	MTU2 channel 1
RAPI_MTU2_2	MTU2 channel 2
RAPI_MTU2_3	MTU2 channel 3
RAPI_MTU2_4	MTU2 channel 4
RAPI_MTU2_5U	MTU2 channel 5
RAPI_MTU2_5V	MTU2 channel 5V
RAPI_MTU2_5W	MTU2 channel 5W
RAPI_TIOCA	TIOC*i*A pin (*i* = 0 to 4)
RAPI_TIOCB	TIOC*i*B pin (*i* = 0 to 4)
RAPI_TIOCC	TIOC*i*C pin (*i* = 0, 3, or 4)
RAPI_TIOCD	TIOC*i*D pin (*i* = 0, 3, or 4)

Return value

If the specification of timer is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

Timer MTU2 (pulse period measurement mode)

Reference

__GetCaptureValue

Remark

If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_timer_sh_7125.h"

void func( void )
{
   unsigned short data[2];

   /* Acquisition of measured values of TGRA and TGRB
      for MTU2 channel 4 in pulse period measurement mode */
   __GetPulsePeriodMeasurementMode( RAPI_MTU2_4 | RAPI_TIOCA |
         RAPI_TIOCB, data );
}
```

17) __CreatePulseWidthMeasurementMode

Synopsis

<Setting for pulse width measurement mode>

Boolean __CreatePulseWidthMeasurementMode(unsigned long data, void *func)

data	Setup data
func	Pointer to callback function

Description (1/5)

Sets the specified timer to pulse width measurement mode.

[data]

For data, set the following parameters. To set multiple parameters at the same time, use the symbol "|" to separate each specified parameter.

RAPI_MTU2_0	MTU2 channel 0
RAPI_MTU2_1	MTU2 channel 1
RAPI_MTU2_2	MTU2 channel 2
RAPI_MTU2_3	MTU2 channel 3
RAPI_MTU2_4	MTU2 channel 4
RAPI_MTU2_5U	MTU2 channel 5U
RAPI_MTU2_5V	MTU2 channel 5V
RAPI_MTU2_5W	MTU2 channel 5W
RAPI_MP_1	Internal clock: counts on MPϕ/1
RAPI_MP_4	Internal clock: counts on MPϕ/4
RAPI_MP_16	Internal clock: counts on MPϕ/16
RAPI_MP_64	Internal clock: counts on MPϕ/64
RAPI_MP_256_1	Internal clock: counts on MPϕ/256 (for channel 1)
RAPI_MP_256_34	Internal clock: counts on MPϕ/256 (for channel 3 or 4)
RAPI_MP_1024_2	Internal clock: counts on MPϕ/1024 (for channel 2)
RAPI_MP_1024_34	Internal clock: counts on MPϕ/1024 (for channel 3 or 4)
RAPI_RISING_EDGE	Counts at rising edge
RAPI_FALLING_EDGE	Counts at falling edge
RAPI_BOTH_EDGE	Counts at both edges
Note: When MPϕ/1 is specified for the count source, count edge is fixed to rising edge.	
RAPI_TCNT_CLEAR_DIS	Disables TCNT clearing
RAPI_TCNT_CLEAR_TGRA	Clears TCNT by TGRA input capture
RAPI_TCNT_CLEAR_TGRB	Clears TCNT by TGRB input capture
RAPI_TCNT_CLEAR_TGRC	Clears TCNT by TGRC input capture
RAPI_TCNT_CLEAR_TGRD	Clears TCNT by TGRD input capture
RAPI_TCNT_CLEAR_TGRU	Clears TCNT by TGRU input capture
RAPI_TCNT_CLEAR_TGRV	Clears TCNT by TGRV input capture
RAPI_TCNT_CLEAR_TGRW	Clears TCNT by TGRW input capture

Description (2/5)

RAPI_OVERFLOW_ENA	Enables overflow interrupt
RAPI_OVERFLOW_DIS	Disables overflow interrupt
RAPI_AD_START_REQ	Enables generation of A/D converter start requests by TGRA input capture/compare match
RAPI_NO_AD_START_REQ	Disables generation of A/D converter start requests by TGRA input capture/compare match
RAPI_TIMER_INT_LV_0	Interrupt priority level 0
RAPI_TIMER_INT_LV_1	Interrupt priority level 1
RAPI_TIMER_INT_LV_2	Interrupt priority level 2
RAPI_TIMER_INT_LV_3	Interrupt priority level 3
RAPI_TIMER_INT_LV_4	Interrupt priority level 4
RAPI_TIMER_INT_LV_5	Interrupt priority level 5
RAPI_TIMER_INT_LV_6	Interrupt priority level 6
RAPI_TIMER_INT_LV_7	Interrupt priority level 7
RAPI_TIMER_INT_LV_8	Interrupt priority level 8
RAPI_TIMER_INT_LV_9	Interrupt priority level 9
RAPI_TIMER_INT_LV_10	Interrupt priority level 10
RAPI_TIMER_INT_LV_11	Interrupt priority level 11
RAPI_TIMER_INT_LV_12	Interrupt priority level 12
RAPI_TIMER_INT_LV_13	Interrupt priority level 13
RAPI_TIMER_INT_LV_14	Interrupt priority level 14
RAPI_TIMER_INT_LV_15	Interrupt priority level 15

- **Selectable parameters when RAPI_MTU2_0 is specified:**

(Count source) Specify one from { RAPI_MP_1, RAPI_MP_4, RAPI_MP_16, RAPI_MP_64 }. The default value is RAPI_MP_1.

(Count edge) Specify one from { RAPI_RISING_EDGE, RAPI_FALLING_EDGE, RAPI_BOTH_EDGE }. The default value is RAPI_RISING_EDGE.
Note: When RAPI_MP1 is specified for the count source, count edge is fixed to the default value.

(Count clearing source) Specify one from { RAPI_TCNT_CLEAR_DIS, RAPI_TCNT_CLEAR_TGRA, RAPI_TCNT_CLEAR_TGRB, RAPI_TCNT_CLEAR_TGRC, RAPI_TCNT_CLEAR_TGRD }. The default value is RAPI_TCNT_CLEAR_DIS.

(A/D converter start request) Specify one from { RAPI_AD_START_REQ, RAPI_NO_AD_START_REQ }. The default value is RAPI_NO_AD_START_REQ.

(Interrupt enable) Specify one from { RAPI_OVERFLOW_ENA, RAPI_OVERFLOW_DIS }. The default value is RAPI_OVERFLOW_DIS.

(Interrupt priority level) Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }. The default value is RAPI_TIMER_INT_LV_0.

Description (3/5)

- **Selectable parameters when RAPI_MTU2_1 is specified:**

(Count source)	Specify one from { RAPI_MP_1, RAPI_MP_4, RAPI_MP_16, RAPI_MP_64, RAPI_MP_256_1 }. The default value is RAPI_MP_1.
(Count edge)	Specify one from { RAPI_RISING_EDGE, RAPI_FALLING_EDGE, RAPI_BOTH_EDGE }. The default value is RAPI_RISING_EDGE. Note: When RAPI_MP1 is specified for the count source, count edge is fixed to the default value.
(Count clearing source)	Specify one from { RAPI_TCNT_CLEAR_DIS, RAPI_TCNT_CLEAR_TGRA, RAPI_TCNT_CLEAR_TGRB }. The default value is RAPI_TCNT_CLEAR_DIS.
(A/D converter start request)	Specify one from { RAPI_AD_START_REQ, RAPI_NO_AD_START_REQ }. The default value is RAPI_NO_AD_START_REQ.
(Interrupt enable)	Specify one from { RAPI_OVERFLOW_ENA, RAPI_OVERFLOW_DIS }. The default value is RAPI_OVERFLOW_DIS.
(Interrupt priority level)	Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }. The default value is RAPI_TIMER_INT_LV_0.

Description (4/5)

- **Selectable parameters when RAPI_MTU2_2 is specified:**

(Count source)	Specify one from { RAPI_MP_1, RAPI_MP_4, RAPI_MP_16, RAPI_MP_64, RAPI_MP_1024_2 }. The default value is RAPI_MP_1.
(Count edge)	Specify one from { RAPI_RISING_EDGE, RAPI_FALLING_EDGE, RAPI_BOTH_EDGE }. The default value is RAPI_RISING_EDGE. Note: When RAPI_MP1 is specified for the count source, count edge is fixed to the default value.
(Count clearing source)	Specify one from { RAPI_TCNT_CLEAR_DIS, RAPI_TCNT_CLEAR_TGRA, RAPI_TCNT_CLEAR_TGRB }. The default value is RAPI_TCNT_CLEAR_DIS.
(A/D converter start request)	Specify one from { RAPI_AD_START_REQ, RAPI_NO_AD_START_REQ }. The default value is RAPI_NO_AD_START_REQ.
(Interrupt enable)	Specify one from { RAPI_OVERFLOW_ENA, RAPI_OVERFLOW_DIS }. The default value is RAPI_OVERFLOW_DIS.
(Interrupt priority level)	Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }. The default value is RAPI_TIMER_INT_LV_0.

Description (5/5)

- **Selectable parameters when RAPI_MTU2_3 or RAPI_MTU2_4 is specified:**

(Count source) Specify one from { RAPI_MP_1, RAPI_MP_4, RAPI_MP_16, RAPI_MP_64, RAPI_MP_256_34, RAPI_MP_1024_34 }. The default value is RAPI_MP_1.

(Count edge) Specify one from { RAPI_RISING_EDGE, RAPI_FALLING_EDGE, RAPI_BOTH_EDGE }. The default value is RAPI_RISING_EDGE.
Note: When RAPI_MP1 is specified for the count source, count edge is fixed to the default value.

(Count clearing source) Specify one from { RAPI_TCNT_CLEAR_DIS, RAPI_TCNT_CLEAR_TGRA, RAPI_TCNT_CLEAR_TGRB, RAPI_TCNT_CLEAR_TGRC, RAPI_TCNT_CLEAR_TGRD }. The default value is RAPI_TCNT_CLEAR_DIS.

(A/D converter start request) Specify one from { RAPI_AD_START_REQ, RAPI_NO_AD_START_REQ }. The default value is RAPI_NO_AD_START_REQ.

(Interrupt enable) Specify one from { RAPI_OVERFLOW_ENA, RAPI_OVERFLOW_DIS }. The default value is RAPI_OVERFLOW_DIS.

(Interrupt priority level) Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }. The default value is RAPI_TIMER_INT_LV_0.

- **Selectable parameters when RAPI_MTU2_5 is specified:**

(Count source) Specify one from { RAPI_MP_1, RAPI_MP_4, RAPI_MP_16, RAPI_MP_64 }. The default value is RAPI_MP_1.

(Count edge) Specify one from { RAPI_RISING_EDGE, RAPI_FALLING_EDGE, RAPI_BOTH_EDGE }. The default value is RAPI_RISING_EDGE.
Note: When RAPI_MP1 is specified for the count source, count edge is fixed to the default value.

(Count clearing source) Specify one from { RAPI_TCNT_CLEAR_DIS, RAPI_TCNT_CLEAR_TGRU, RAPI_TCNT_CLEAR_TGRV, RAPI_TCNT_CLEAR_TGRW }. The default value is RAPI_TCNT_CLEAR_DIS.

[func]
For func, specify a pointer to callback function. If this pointer is not specifed, set RAPI_NULL.

Return value

If the specification of timer is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

Timer MTU2 (pulse width measurement mode)

Reference

__CreateInputCapture

Remark

If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_timer_sh_7125.h"

/* Declaration of callback function */
void TimerIntFunc( void );

void func( void )
{
   /* Setting MTU2 channel 4 for pulse width measurement mode */
   __CreatePulseWidthMeasurementMode( RAPI_MTU2_4 | RAPI_MP_4 |
         RAPI_RISING_EDGE | RAPI_TCNT_CLEAR_TGRB |
         RAPI_OVERFLOW_DIS | RAPI_TIMER_INT_LV_0, TimerIntFunc);
}
```

18) __SetInputWidthPin

Synopsis

<Setting of input pin for pulse width measurement>

Boolean __SetInputWidthPin(unsigned long data, void *func)

data	Setup data
func	Pointer to callback function

Description (1/3)

Sets the specified pin to input for pulse width measurement.

[data]

For data, set the following parameters. To set multiple parameters at the same time, use the symbol "|" to separate each specified parameter.

RAPI_MTU2_0	MTU2 channel 0
RAPI_MTU2_1	MTU2 channel 1
RAPI_MTU2_2	MTU2 channel 2
RAPI_MTU2_3	MTU2 channel 3
RAPI_MTU2_4	MTU2 channel 4
RAPI_MTU2_5U	MTU2 channel 5U
RAPI_MTU2_5V	MTU2 channel 5V
RAPI_MTU2_5W	MTU2 channel 5W
RAPI_TIOCA	TIOC*i*A pin (*i* = 0 to 4)
RAPI_TIOCB	TIOC*i*B pin (*i* = 0 to 4)
RAPI_TIOCC	TIOC*i*C pin (*i* = 0, 3, or 4)
RAPI_TIOCD	TIOC*i*D pin (*i* = 0, 3, or 4)
RAPI_CAPTURE_ENA	Enables TGR*i* input capture interrupt (*i* = A, B, C, D, U, V, or W)
RAPI_CAPTURE_DIS	Disables input capture interrupt
RAPI_TIMER_INT_LV_0	Interrupt priority level 0
RAPI_TIMER_INT_LV_1	Interrupt priority level 1
RAPI_TIMER_INT_LV_2	Interrupt priority level 2
RAPI_TIMER_INT_LV_3	Interrupt priority level 3
RAPI_TIMER_INT_LV_4	Interrupt priority level 4
RAPI_TIMER_INT_LV_5	Interrupt priority level 5
RAPI_TIMER_INT_LV_6	Interrupt priority level 6
RAPI_TIMER_INT_LV_7	Interrupt priority level 7
RAPI_TIMER_INT_LV_8	Interrupt priority level 8
RAPI_TIMER_INT_LV_9	Interrupt priority level 9
RAPI_TIMER_INT_LV_10	Interrupt priority level 10
RAPI_TIMER_INT_LV_11	Interrupt priority level 11
RAPI_TIMER_INT_LV_12	Interrupt priority level 12
RAPI_TIMER_INT_LV_13	Interrupt priority level 13
RAPI_TIMER_INT_LV_14	Interrupt priority level 14
RAPI_TIMER_INT_LV_15	Interrupt priority level 15

Description (2/3)

- **Selectable parameters when RAPI_MTU2_0, RAPI_MTU2_3, or RAPI_MTU2_4 is specified:**

  (Capture channel) Specify one from { RAPI_TIOCA, RAPI_TIOCB, RAPI_TIOCC, RAPI_TIOCD }.

  (Interrupt enable) Specify one from { RAPI_CAPTURE_ENA, RAPI_CAPTURE_DIS }.
  The default value is RAPI_CAPTURE_DIS.

  (Interrupt priority level) Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }.
  The default value is RAPI_TIMER_INT_LV_0.

- **Selectable parameters when RAPI_MTU2_1 or RAPI_MTU2_2 is specified:**

  (Capture channel) Specify one from { RAPI_TIOCA, RAPI_TIOCB }.

  (Interrupt enable) Specify one from { RAPI_CAPTURE_ENA, RAPI_CAPTURE_DIS }.
  The default value is RAPI_CAPTURE_DIS.

  (Interrupt priority level) Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }.
  The default value is RAPI_TIMER_INT_LV_0.

- **Selectable parameters when RAPI_MTU2_5 is specified:**

  (Capture channel) Specify one from { RAPI_MTU2_5U, RAPI_MTU2_5V, RAPI_MTU2_5W }.

  (Interrupt enable) Specify one from { RAPI_CAPTURE_ENA, RAPI_CAPTURE_DIS }.
  The default value is RAPI_CAPTURE_DIS.

  (Interrupt priority level) Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }.
  The default value is RAPI_TIMER_INT_LV_0.

Description (3/3)

[func]
For func, specify a pointer to callback function. If this pointer is not specified, set RAPI_NULL.

Return value

If the specification of timer is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

Timer MTU2 (pulse width measurement mode)

Reference

__SetInputCapturePin

Remark

If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_timer_sh_7125.h"

/* Declaration of callback function */
void TimerIntFunc( void );

void func( void )
{
   /* Setting TGRA for MTU2 channel 4 as input capture pin */
   __SetInputWidthPin( RAPI_MTU2_4 | RAPI_TIOCA | RAPI_CAPTURE_ENA |
         RAPI_TIMER_INT_LV_3, TimerIntFunc );
}
```

19) __EnablePulseWidthMeasurementMode

Synopsis

<Operation control for pulse width measurement mode>
Boolean __EnablePulseWidthMeasurementMode(unsigned long data)

data	Setup data

Description

Controls start/stop operation of the specified timer in pulse width measurement mode.

[data]
For data, set the following parameters. To set multiple parameters at the same time, use the symbol "|" to separate each specified parameter. Then several timers can be enabled or disabled at the same time.

RAPI_MTU2_0	MTU2 channel 0
RAPI_MTU2_1	MTU2 channel 1
RAPI_MTU2_2	MTU2 channel 2
RAPI_MTU2_3	MTU2 channel 3
RAPI_MTU2_4	MTU2 channel 4
RAPI_MTU2_5U	MTU2 channel 5U
RAPI_MTU2_5V	MTU2 channel 5V
RAPI_MTU2_5W	MTU2 channel 5W
RAPI_TIMER_ON	Starts the timer in pulse width measurement mode
RAPI_TIMER_OFF	Stops the timer in pulse width measurement mode

Return value

If the specification of timer is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

Timer MTU2 (pulse width measurement mode)

Reference

__EnableInputCapture

Remark

If an undefined value is specified in the argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_timer_sh_7125.h"

void func( void )
{
    /* Start-up timer for MTU2 channel 4
       in pulse width measurement mode */
    __EnablePulseWidthMeasurementMode( RAPI_MTU2_4 | RAPI_TIMER_ON );
}
```

20) __DestroyPulseWidthMeasurementMode

Synopsis

<Clearing of setting for pulse width measurement mode>

Boolean __DestroyPulseWidthMeasurementMode(unsigned long data)

data	Setup data

Description

Clears settings of the specified timer in pulse width measurement mode.

[data]

For data, set the following parameters. To set multiple parameters at the same time, use the symbol "|" to separate each specified parameter. Then several settings of timers can be cleared at the same time.

RAPI_MTU2_0	MTU2 channel 0
RAPI_MTU2_1	MTU2 channel 1
RAPI_MTU2_2	MTU2 channel 2
RAPI_MTU2_3	MTU2 channel 3
RAPI_MTU2_4	MTU2 channel 4
RAPI_MTU20_4	MTU2 channels 0 to 4
RAPI_MTU2_5U	MTU2 channel 5U
RAPI_MTU2_5V	MTU2 channel 5V
RAPI_MTU2_5W	MTU2 channel 5W
RAPI_MTU2_5	MTU2 channels 5U, 5V, and 5W
RAPI_MTU2_ALL	All MTU2 channels

Return value

If the specification of timer is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

Timer MTU2 (pulse width measurement mode)

Reference

__DestroyInputCapture

Remark

If an undefined value is specified in the argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_timer_sh_7125.h"

void func( void )
{
    /* Clearing setting of MTU2 channel 4
       in pulse width measurement mode */
    __DestroyPulseWidthMeasurementMode( RAPI_MTU2_4 );
}
```

21) __GetPulseWidthMeasurementMode

Synopsis

<Acquisition of measured value in pulse width measurement mode>
Boolean __GetPulseWidthMeasurementMode(unsigned long data1, unsigned short *data2)

data1	Setup data 1
data2	Pointer to the buffer in which counter value is stored

Description

Acquires the counter value of the specified timer in pulse width measurement mode.

[data1]
For data1, set the following parameters. To set multiple parameters at the same time, use the symbol "|" to separate each parameter. Then several pins can be selected at the same time.

RAPI_MTU2_0	MTU2 channel 0
RAPI_MTU2_1	MTU2 channel 1
RAPI_MTU2_2	MTU2 channel 2
RAPI_MTU2_3	MTU2 channel 3
RAPI_MTU2_4	MTU2 channel 4
RAPI_MTU2_5U	MTU2 channel 5U
RAPI_MTU2_5V	MTU2 channel 5V
RAPI_MTU2_5W	MTU2 channel 5W
RAPI_TIOCA	TIOC*i*A pin (*i* = 0 to 4)
RAPI_TIOCB	TIOC*i*B pin (*i* = 0 to 4)
RAPI_TIOCC	TIOC*i*C pin (*i* = 0, 3, or 4)
RAPI_TIOCD	TIOC*i*D pin (*i* = 0, 3, or 4)

Return value

If the specification of timer is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

Timer MTU2 (pulse width measurement mode)

Reference

__GetCaptureValue

Remark

- If the state of the specified pin is high (for "L") when this API is executed, the counter value of the last "L" period ("H" period) is stored in data2. Note that this API does not read the pin state. A user needs the discriminant processing for the pin state before executing this API. (Refer to the following "*Program example*".)
- If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_timer_sh_7125.h"

void func( void )
{
   unsigned short data[2];

   /* Acquisition of measured values of TGRA and TGRB
      for MTU2 channel 4 in pulse width measurement mode */
   __GetPulseWidthMeasurementMode( RAPI_MTU2_4 | RAPI_TIOCA |
         RAPI_TIOCB, data );
}
```

22) __CreateInputCapture

Synopsis

<Setting for input capture mode>

Boolean __CreateInputCapture(unsigned long data1, void *func)

data1	Setup data 1
func	Pointer to callback function

Description (1/6)

Sets the specified timer to input capture mode.

[data1]

For data1, set the following parameters. To set multiple parameters at the same time, use the symbol "|" to separate each specified parameter.

RAPI_MTU2_0	MTU2 channel 0
RAPI_MTU2_1	MTU2 channel 1
RAPI_MTU2_2	MTU2 channel 2
RAPI_MTU2_3	MTU2 channel 3
RAPI_MTU2_4	MTU2 channel 4
RAPI_MTU2_5U	MTU2 channel 5U
RAPI_MTU2_5V	MTU2 channel 5V
RAPI_MTU2_5W	MTU2 channel 5W
RAPI_MP_1	Internal clock: counts on MPϕ/1
RAPI_MP_4	Internal clock: counts on MPϕ/4
RAPI_MP_16	Internal clock: counts on MPϕ/16
RAPI_MP_64	Internal clock: counts on MPϕ/64
RAPI_MP_256_1	Internal clock: counts on MPϕ/256 (for channel 1)
RAPI_MP_256_34	Internal clock: counts on MPϕ/256 (for channel 3 or 4)
RAPI_MP_1024_2	Internal clock: counts on MPϕ/1024 (for channel 2)
RAPI_MP_1024_34	Internal clock: counts on MPϕ/1024 (for channel 3 or 4)
RAPI_EXTER_TCLKA_0	External clock: counts on TCLKA pin input (for channel 0 to 2)
RAPI_EXTER_TCLKB_0	External clock: counts on TCLKB pin input (for channel 0 to 2)
RAPI_EXTER_TCLKC_0	External clock: counts on TCLKC pin input (for channel 0 or 2)
RAPI_EXTER_TCLKD_0	External clock: counts on TCLKD pin input (for channel 0 or 2)
RAPI_EXTER_TCLKA_3	External clock: counts on TCLKA pin input (for channel 3 or 4)
RAPI_EXTER_TCLKB_3	External clock: counts on TCLKB pin input (for channel 3 or 4)
RAPI_RISING_EDGE	Counts at rising edge
RAPI_FALLING_EDGE	Counts at falling edge
RAPI_BOTH_EDGE	Counts at both edges
Notes: When MPϕ/1 is specified for the count source, count edge is fixed to rising edge.	

Description (2/6)

RAPI_TCNT_CLEAR_DIS	Disables TCNT clearing
RAPI_TCNT_CLEAR_TGRA	Clears TCNT by TGRA input capture
RAPI_TCNT_CLEAR_TGRB	Clears TCNT by TGRB input capture
RAPI_TCNT_CLEAR_TGRC	Clears TCNT by TGRC input capture
RAPI_TCNT_CLEAR_TGRD	Clears TCNT by TGRD input capture
RAPI_TCNT_CLEAR_TGRU	Clears TCNT by TGRU input capture
RAPI_TCNT_CLEAR_TGRV	Clears TCNT by TGRV input capture
RAPI_TCNT_CLEAR_TGRW	Clears TCNT by TGRW input capture
RAPI_TCNT_CLEAR_OTHER	Clears TCNT by counter clearing during synchronously clearing/operating for another channel
RAPI_OVERFLOW_ENA	Enables overflow interrupt
RAPI_OVERFLOW_DIS	Disables overflow interrupt
RAPI_AD_START_REQ	Enables generation of A/D converter start requests by TGRA input capture/compare match
RAPI_NO_AD_START_REQ	Disables generation of A/D converter start requests by TGRA input capture/compare match
RAPI_TIMER_INT_LV_0	Interrupt priority level 0
RAPI_TIMER_INT_LV_1	Interrupt priority level 1
RAPI_TIMER_INT_LV_2	Interrupt priority level 2
RAPI_TIMER_INT_LV_3	Interrupt priority level 3
RAPI_TIMER_INT_LV_4	Interrupt priority level 4
RAPI_TIMER_INT_LV_5	Interrupt priority level 5
RAPI_TIMER_INT_LV_6	Interrupt priority level 6
RAPI_TIMER_INT_LV_7	Interrupt priority level 7
RAPI_TIMER_INT_LV_8	Interrupt priority level 8
RAPI_TIMER_INT_LV_9	Interrupt priority level 9
RAPI_TIMER_INT_LV_10	Interrupt priority level 10
RAPI_TIMER_INT_LV_11	Interrupt priority level 11
RAPI_TIMER_INT_LV_12	Interrupt priority level 12
RAPI_TIMER_INT_LV_13	Interrupt priority level 13
RAPI_TIMER_INT_LV_14	Interrupt priority level 14
RAPI_TIMER_INT_LV_15	Interrupt priority level 15
RAPI_TIMER_SYNC	Synchronizes operation for channels 0 to 4
RAPI_TIMER_NO_SYNC	Does not synchronize operation for channels 0 to 4

Description (3/6)

- **Selectable parameters when RAPI_MTU2_0 is specified:**

(Count source)	Specify one from { RAPI_MP_1, RAPI_MP_4, RAPI_MP_16, RAPI_MP_64, RAPI_EXTER_TCLKA_0, RAPI_EXTER_TCLKB_0, RAPI_EXTER_TCLKC_0, RAPI_EXTER_TCLKD_0 }. The default value is RAPI_MP_1.
(Count edge)	Specify one from { RAPI_RISING_EDGE, RAPI_FALLING_EDGE, RAPI_BOTH_EDGE }. The default value is RAPI_RISING_EDGE. Note: When RAPI_MP1 is specified for the count source, count edge is fixed to the default value.
(Count clearing source)	Specify one from { RAPI_TCNT_CLEAR_DIS, RAPI_TCNT_CLEAR_TGRA, RAPI_TCNT_CLEAR_TGRB, RAPI_TCNT_CLEAR_TGRC, RAPI_TCNT_CLEAR_TGRD, RAPI_TCNT_CLEAR_OTHER }. The default value is RAPI_TCNT_CLEAR_DIS.
(A/D converter start request)	Specify one from { RAPI_AD_START_REQ, RAPI_NO_AD_START_REQ }. The default value is RAPI_NO_AD_START_REQ.
(Interrupt enable)	Specify one from { RAPI_OVERFLOW_ENA, RAPI_OVERFLOW_DIS }. The default value is RAPI_OVERFLOW_DIS.
(Interrupt priority level)	Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }. The default value is RAPI_TIMER_INT_LV_0.

Description (4/6)

- **Selectable parameters when RAPI_MTU2_1 is specified:**

(Count source)	Specify one from { RAPI_MP_1, RAPI_MP_4, RAPI_MP_16, RAPI_MP_64, RAPI_MP_256_1, RAPI_EXTER_TCLKA_0, RAPI_EXTER_TCLKB_0 }. The default value is RAPI_MP_1.
(Count edge)	Specify one from { RAPI_RISING_EDGE, RAPI_FALLING_EDGE, RAPI_BOTH_EDGE }. The default value is RAPI_RISING_EDGE. Note: When RAPI_MP1 is specified for the count source, count edge is fixed to the default value.
(Count clearing source)	Specify one from { RAPI_TCNT_CLEAR_DIS, RAPI_TCNT_CLEAR_TGRA, RAPI_TCNT_CLEAR_TGRB, RAPI_TCNT_CLEAR_OTHER }. The default value is RAPI_TCNT_CLEAR_DIS.
(A/D converter start request)	Specify one from { RAPI_AD_START_REQ, RAPI_NO_AD_START_REQ }. The default value is RAPI_NO_AD_START_REQ.
(Interrupt enable)	Specify one from { RAPI_OVERFLOW_ENA, RAPI_OVERFLOW_DIS }. The default value is RAPI_OVERFLOW_DIS.
(Interrupt priority level)	Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }. The default value is RAPI_TIMER_INT_LV_0.

Description (5/6)

- **Selectable parameters when RAPI_MTU2_2 is specified:**

(Count source)	Specify one from { RAPI_MP_1, RAPI_MP_4, RAPI_MP_16, RAPI_MP_64, RAPI_MP_1024_2, RAPI_EXTER_TCLKA_0, RAPI_EXTER_TCLKB_0, RAPI_EXTER_TCLKC_0 }. The default value is RAPI_MP_1.
(Count edge)	Specify one from { RAPI_RISING_EDGE, RAPI_FALLING_EDGE, RAPI_BOTH_EDGE }. The default value is RAPI_RISING_EDGE. Note: When RAPI_MP1 is specified for the count source, count edge is fixed to the default value.
(Count clearing source)	Specify one from { RAPI_TCNT_CLEAR_DIS, RAPI_TCNT_CLEAR_TGRA, RAPI_TCNT_CLEAR_TGRB, RAPI_TCNT_CLEAR_OTHER }. The default value is RAPI_TCNT_CLEAR_DIS.
(A/D converter start request)	Specify one from { RAPI_AD_START_REQ, RAPI_NO_AD_START_REQ }. The default value is RAPI_NO_AD_START_REQ.
(Interrupt enable)	Specify one from { RAPI_OVERFLOW_ENA, RAPI_OVERFLOW_DIS }. The default value is RAPI_OVERFLOW_DIS.
(Interrupt priority level)	Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }. The default value is RAPI_TIMER_INT_LV_0.

Description (6/6)

- **Selectable parameters when RAPI_MTU2_3 or RAPI_MTU2_4 is specified:**

  (Count source) Specify one from { RAPI_MP_1, RAPI_MP_4, RAPI_MP_16, RAPI_MP_64, RAPI_MP_256_34, RAPI_MP_1024_34, RAPI_EXTER_TCLKA_3, RAPI_EXTER_TCLKB_3 }. The default value is RAPI_MP_1.

  (Count edge) Specify one from { RAPI_RISING_EDGE, RAPI_FALLING_EDGE, RAPI_BOTH_EDGE }. The default value is RAPI_RISING_EDGE.
  Note: When RAPI_MP1 is specified for the count source, count edge is fixed to the default value.

  (Count clearing source) Specify one from { RAPI_TCNT_CLEAR_DIS, RAPI_TCNT_CLEAR_TGRA, RAPI_TCNT_CLEAR_TGRB, RAPI_TCNT_CLEAR_TGRC, RAPI_TCNT_CLEAR_TGRD, RAPI_TCNT_CLEAR_OTHER }. The default value is RAPI_TCNT_CLEAR_DIS.

  (A/D converter start request) Specify one from { RAPI_AD_START_REQ, RAPI_NO_AD_START_REQ }. The default value is RAPI_NO_AD_START_REQ.

  (Interrupt enable) Specify one from { RAPI_OVERFLOW_ENA, RAPI_OVERFLOW_DIS }. The default value is RAPI_OVERFLOW_DIS.

  (Interrupt priority level) Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }. The default value is RAPI_TIMER_INT_LV_0.

- **Selectable parameters when RAPI_MTU2_5 is specified:**

  (Count source) Specify one from { RAPI_MP_1, RAPI_MP_4, RAPI_MP_16, RAPI_MP_64 }. The default value is RAPI_MP_1.

  (Count clearing source) Specify one from { RAPI_TCNT_CLEAR_DIS, RAPI_TCNT_CLEAR_TGRU, RAPI_TCNT_CLEAR_TGRV, RAPI_TCNT_CLEAR_TGRW }. The default value is RAPI_TCNT_CLEAR_DIS.

- **Parameters when synchronous operation is specified:**
  When setting synchronous operation for any channels 0 to 4, specify RAPI_TIMER_SYNC. When not setting synchronous operation (each channel operates independently), specify RAPI_TIMER_NO_SYNC.
  The default value is RAPI_TIMER_NO_SYNC.

[func]
Specify a pointer to callback function. If this pointer is not specified, set RAPI_NULL.

Return value

If the specification of timer is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

Timer MTU2 (input capture mode)

Reference

__EnableInputCapture, __DestroyInputCapture, __GetCaptureValue

Remark

If an undefined value is specified in the argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_timer_sh_7125.h"

/* Declaration of callback function */
void TimerIntFunc( void );

void func( void )
{
   /* Setting MTU2 channel0 for input capture mode */
   __CreateInputCapture( RAPI_MTU2_0 | RAPI_MP_4 | RAPI_BOTH_EDGE |
         RAPI_TCNT_CLEAR_TGRB | RAPI_OVERFLOW_DIS |
         RAPI_TIMER_INT_LV_0 | RAPI_TIMER_NO_SYNC, TimerIntFunc );
}
```

23) __SetInputCapturePin

Synopsis

<Setting of input pin for input capture>

Boolean __SetInputCapturePin(unsigned long data, void *func)

data	Setup data
func	Pointer to callback function

Description (1/3)

Sets the specified pin for input capture.

[data]

For data, set the following parameters. To set multiple parameters at the same time, use the symbol "|" to separate each specified parameter.

RAPI_MTU2_0	MTU2 channel 0
RAPI_MTU2_1	MTU2 channel 1
RAPI_MTU2_2	MTU2 channel 2
RAPI_MTU2_3	MTU2 channel 3
RAPI_MTU2_4	MTU2 channel 4
RAPI_MTU2_5U	MTU2 channel 5U
RAPI_MTU2_5V	MTU2 channel 5V
RAPI_MTU2_5W	MTU2 channel 5W
RAPI_TIOCA	TIOC*i*A pin (*i* = 0 to 4)
RAPI_TIOCB	TIOC*i*B pin (*i* = 0 to 4)
RAPI_TIOCC	TIOC*i*C pin (*i* = 0, 3, or 4)
RAPI_TIOCD	TIOC*i*D pin (*i* = 0, 3, or 4)
RAPI_RISING_CAP_0	Input capture at rising edge (for channel 0 to 4)
RAPI_FALLING_CAP_0	Input capture at falling edge (for channel 0 to 4)
RAPI_BOTH_CAP_0	Input capture at both edges (for channel 0 to 4)
RAPI_RISING_CAP_5	Input capture at rising edge (for channel 5)
RAPI_FALLING_CAP_5	Input capture at falling edge (for channel 5)
RAPI_BOTH_CAP_5	Input capture at both edges (for channel 5)
RAPI_TCNT1_CAP	Capture input source is channel 1/count clock. Input capture at TCNT_1 count-up/count-down (for channel 0)
RAPI_TGRC0_CAP	Input capture at generation of TGRC_0 compare match/ input capture (for channel 1: TIOC1B pin)
RAPI_TGRA0_CAP	Input capture at generation of TGRA_0 compare match/ input capture (for channel 1: TIOC1A pin)
RAPI_CAPTURE_ENA	Enables TGR*i* input capture interrupt (*i* = A, B, C, D, U, V, or W)
RAPI_CAPTURE_DIS	Disables input capture interrupt
RAPI_TIMER_INT_LV_0	Interrupt priority level 0
RAPI_TIMER_INT_LV_1	Interrupt priority level 1
RAPI_TIMER_INT_LV_2	Interrupt priority level 2
RAPI_TIMER_INT_LV_3	Interrupt priority level 3
RAPI_TIMER_INT_LV_4	Interrupt priority level 4
RAPI_TIMER_INT_LV_5	Interrupt priority level 5
RAPI_TIMER_INT_LV_6	Interrupt priority level 6
RAPI_TIMER_INT_LV_7	Interrupt priority level 7
RAPI_TIMER_INT_LV_8	Interrupt priority level 8
RAPI_TIMER_INT_LV_9	Interrupt priority level 9
RAPI_TIMER_INT_LV_10	Interrupt priority level 10
RAPI_TIMER_INT_LV_11	Interrupt priority level 11
RAPI_TIMER_INT_LV_12	Interrupt priority level 12
RAPI_TIMER_INT_LV_13	Interrupt priority level 13
RAPI_TIMER_INT_LV_14	Interrupt priority level 14
RAPI_TIMER_INT_LV_15	Interrupt priority level 15

Description (2/3)

- **Selectable parameters when RAPI_MTU2_0, RAPI_MTU2_3, or RAPI_MTU2_4 is specified:**

(Capture channel)	Specify one from { RAPI_TIOCA, RAPI_TIOCB, RAPI_TIOCC, RAPI_TIOCD }.
(Capture edge)	Specify one from { RAPI_RISING_CAP_0, RAPI_FALLING_CAP_0, RAPI_BOTH_CAP_0, RAPI_TGRC0_CAP, RAPI_TGRA0_CAP }.
(Interrupt enable)	Specify one from { RAPI_CAPTURE_ENA, RAPI_CAPTURE_DIS }. The default value is RAPI_CAPTURE_DIS.
(Interrupt priority level)	Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }. The default value is RAPI_TIMER_INT_LV_0.

- **Selectable parameters when RAPI_MTU2_1 or RAPI_MTU2_2 is specified:**

(Capture channel)	Specify one from { RAPI_TIOCA, RAPI_TIOCB }.
(Capture edge)	Specify one from { RAPI_RISING_CAP_0, RAPI_FALLING_CAP_0, RAPI_BOTH_CAP_0, RAPI_TGRC0_CAP, RAPI_TGRA0_CAP }.
(Interrupt enable)	Specify one from { RAPI_CAPTURE_ENA, RAPI_CAPTURE_DIS } The default value is RAPI_CAPTURE_DIS.
(Interrupt priority level)	Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }. The default value is RAPI_TIMER_INT_LV_0.

Description (3/3)

- **Selectable parameters when RAPI_MTU2_5 is specified:**

(Capture channel)	Specify one from { RAPI_MTU2_5U, RAPI_MTU2_5V, RAPI_MTU2_5W }.
(Capture edge)	Specify one from { RAPI_RISING_CAP_5, RAPI_FALLING_CAP_5, RAPI_BOTH_CAP_5, RAPI_TCNT1_CAP }.
(Interrupt enable)	Specify one from { RAPI_CAPTURE_ENA, RAPI_CAPTURE_DIS } The default value is RAPI_CAPTURE_DIS.
(Interrupt priority level)	Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }. The default value is RAPI_TIMER_INT_LV_0.

[func]
For func, specify a pointer to callback function. If this pointer is not specified, set RAPI_NULL.

Return value

If the specification of timer is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

Timer MTU2 (input capture mode)

Reference

__EnableInputCapture, __DestroyInputCapture, __GetCaptureValue

Remark

If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_timer_sh_7125.h"

/* Declaration of callback function */
void TimerIntFunc( void );

void func( void )
{
   /* Setting TGRA for MTU2 channel 0 as input capture pin */
   __SetInputCapturePin( RAPI_MTU2_0 | RAPI_TIOCA |
          RAPI_RISING_CAP_0 | RAPI_CAPTURE_ENA |
          RAPI_TIMER_INT_LV_3, TimerIntFunc);
}
```

24) __EnableInputCapture

Synopsis

<Operation control for input capture mode>

Boolean __EnableInputCapture(unsigned long data)

data	Setup data

Description

Controls start/stop operation of the specified timer in input capture mode.

[data]

For data, set the following parameters. To set multiple parameters at the same time, use the symbol "|" to separate each specified parameter. Then several timers can be enabled or disabled at the same time.

RAPI_MTU2_0	MTU2 channel 0
RAPI_MTU2_1	MTU2 channel 1
RAPI_MTU2_2	MTU2 channel 2
RAPI_MTU2_3	MTU2 channel 3
RAPI_MTU2_4	MTU2 channel 4
RAPI_MTU2_5U	MTU2 channel 5U
RAPI_MTU2_5V	MTU2 channel 5V
RAPI_MTU2_5W	MTU2 channel 5W
RAPI_TIMER_ON	Starts the timer in input capture mode
RAPI_TIMER_OFF	Stops the timer in input capture mode

Return value

If the specification of timer is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

Timer MTU2 (input capture mode)

Reference

__CreateInputCapture, __DestroyInputCapture, __GetCaptureValue

Remark

If an undefined value is specified in the argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_timer_sh_7125.h"

void func( void )
{
    /* Start-up timer for MTU2 channels 1 and 2
       in input capture mode */
    __EnableInputCapture( RAPI_MTU2_1 | RAPI_MTU2_2 | RAPI_TIMER_ON );
}
```

25) __DestroyInputCapture

Synopsis

<Clearing of setting for input capture mode>

Boolean __DestroyInputCapture(unsigned long data)

data	Setup data

Description

Clears setting of the specified timer in input capture mode.

[data]

For data, set the following parameters. To set multiple parameters at the same time, use the symbol "|" to separate each specified parameter. Then settings of several timers can be cleared at the same time.

RAPI_MTU2_0	MTU2 channel 0
RAPI_MTU2_1	MTU2 channel 1
RAPI_MTU2_2	MTU2 channel 2
RAPI_MTU2_3	MTU2 channel 3
RAPI_MTU2_4	MTU2 channel 4
RAPI_MTU20_4	MTU2 channels 0 to 4
RAPI_MTU2_5U	MTU2 channel 5U
RAPI_MTU2_5V	MTU2 channel 5V
RAPI_MTU2_5W	MTU2 channel 5W
RAPI_MTU2_5	MTU2 channels 5U, 5V, and 5W
RAPI_MTU2_ALL	All MTU2 channels

Return value

If the specification of timer is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

Timer MTU2 (input capture mode)

Reference

__CreateInputCapture, __EnableInputCapture, __GetCaptureValue

Remark

If an undefined value is specified in the argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_timer_sh_7125.h"

void func( void )
{
    /* Clearing settings of MTU2 channels 2 and 3
       in input capture mode */
    __DestroyInputCapture( RAPI_MTU2_2 | RAPI_MTU2_3 );
}
```

26) __GetCaptureValue

Synopsis

<Acquisition of counter value in input capture mode>
Boolean __GetCaptureValue(unsigned long data1, unsigned short *data2)

data1	Setup data 1
data2	Stores the value of the timer counter.

Description

Acquires the counter value of the specified timer in input capture mode.

[data1]
For data1, set the following parameters. To set multiple parameters at the same time, use the symbol "|" to separate each specified parameter. Then several pins can be selected at the same time.

RAPI_MTU2_0	MTU2 channel 0
RAPI_MTU2_1	MTU2 channel 1
RAPI_MTU2_2	MTU2 channel 2
RAPI_MTU2_3	MTU2 channel 3
RAPI_MTU2_4	MTU2 channel 4
RAPI_MTU2_5U	MTU2 channel 5U
RAPI_MTU2_5V	MTU2 channel 5V
RAPI_MTU2_5W	MTU2 channel 5W
RAPI_TIOCA	MTU2 TIOC*i*A (*i* = 0 to 4)
RAPI_TIOCB	MTU2 TIOC*i*B (*i* = 0 to 4)
RAPI_TIOCC	MTU2 TIOC*i*C (*i* = 0, 3, and 4)
RAPI_TIOCD	MTU2 TIOC*i*D (*i* = 0, 3, and 4)

Return value

If the specification of timer is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

Timer MTU2 (input capture mode)

Reference

__CreateInputCapture, __EnableInputCapture, __DestroyInputCapture

Remark

If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_timer_sh_7125.h"

void func( void )
{
    unsigned short data;

    /* Acquisition of counter value for MTU2 channel 5U
       in input capture mode */
    __GetInputCapture( RAPI_MTU2_5U, &data );
}
```

27) __CreateOutputCompare

Synopsis

<Setting for output compare mode>

Boolean __CreateOutputCompare(unsigned long data)

data	Setup data

Description (1/3)

Sets the specified timer to output compare mode.

[data]

For data, set the following parameters. To set multiple parameters at the same time, use the symbol "|" to separate each specified parameter.

RAPI_MTU2_0	MTU2 channel 0
RAPI_MTU2_1	MTU2 channel 1
RAPI_MTU2_2	MTU2 channel 2
RAPI_MTU2_3	MTU2 channel 3
RAPI_MTU2_4	MTU2 channel 4
RAPI_MP1	Internal clock: counts on MPϕ/1
RAPI_MP4	Internal clock: counts on MPϕ/4
RAPI_MP16	Internal clock: counts on MPϕ/16
RAPI_MP64	Internal clock: counts on MPϕ/64
RAPI_MP256_1	Internal clock: counts on MPϕ/256 (for channel 1)
RAPI_MP256_34	Internal clock: counts on MPϕ/256 (for channel 3 or 4)
RAPI_MP1024_2	Internal clock: counts on MPϕ/1024 (for channel 2)
RAPI_MP1024_34	Internal clock: counts on MPϕ/1024 (for channel 3 or 4)
RAPI_EXTER_TCLKA_0	External clock: counts on TCLKA pin input (for channel 0 to 2)
RAPI_EXTER_TCLKB_0	External clock: counts on TCLKB pin input (for channel 0 to 2)
RAPI_EXTER_TCLKC_0	External clock: counts on TCLKC pin input (for channel 0 or 2)
RAPI_EXTER_TCLKD_0	External clock: counts on TCLKD pin input (for channel 0 or 2)
RAPI_EXTER_TCLKA_3	External clock: counts on TCLKA pin input (for channel 3 or 4)
RAPI_EXTER_TCLKB_3	External clock: counts on TCLKB pin input (for channel 3 or 4)
RAPI_RISING_EDGE	Count at rising edge
RAPI_FALLING_EDGE	Count at falling edge
RAPI_BOTH_EDGE	Count at both edges
Note: When MPϕ/1 is specified for the count source, count edge is fixed to rising edge.	
RAPI_TCNT_CLEAR_TGRA	Clears TCNT by TGRA compare match
RAPI_TCNT_CLEAR_TGRB	Clears TCNT by TGRB compare match
RAPI_TCNT_CLEAR_TGRC	Clears TCNT by TGRC compare match
RAPI_TCNT_CLEAR_TGRD	Clears TCNT by TGRD compare match
RAPI_TCNT_CLEAR_OTHER	Clears TCNT by counter clearing during synchronously clearing/operating for another channel
RAPI_AD_START_REQ	Enables generation of A/D converter start requests by TGRA input capture/compare match
RAPI_NO_AD_START_REQ	Disables generation of A/D converter start requests by TGRA input capture/compare match
RAPI_TIMER_SYNC	Synchronizes operation for channels 0 to 4
RAPI_TIMER_NO_SYNC	Does not synchronize operation for channels 0 to 4

Description (2/3)

- **Selectable parameters when RAPI_MTU2_0 is specified:**

(Count source)	Specify one from { RAPI_MP1, RAPI_MP4, RAPI_MP16, RAPI_MP64, RAPI_EXTER_TCLKA_0, RAPI_EXTER_TCLKB_0, RAPI_EXTER_TCLKC_0, RAPI_EXTER_TCLKD_0 }. The default value is RAPI_MP1.
(Count edge)	Specify one from { RAPI_RISING_EDGE, RAPI_FALLING_EDGE, RAPI_BOTH_EDGE }. The default value is RAPI_RISING_EDGE. Note: When RAPI_MP_1 is specified for the count source, count edge is fixed to the default value.
(Count clearing source)	Specify one from { RAPI_TCNT_CLEAR_TGRA, RAPI_TCNT_CLEAR_TGRB, RAPI_TCNT_CLEAR_TGRC, RAPI_TCNT_CLEAR_TGRD }. The default value is RAPI_TCNT_CLEAR_DIS.
(A/D converter start request)	Specify one from { RAPI_AD_START_REQ, RAPI_NO_AD_START_REQ }. The default value is RAPI_NO_AD_START_REQ.

- **Selectable parameters when RAPI_MTU2_1 is specified:**

(Count source)	Specify one from { RAPI_MP1, RAPI_MP4, RAPI_MP16, RAPI_MP64, RAPI_MP256_1, RAPI_EXTER_TCLKA_0, RAPI_EXTER_TCLKB_0 }. The default value is RAPI_MP1.
(Count edge)	Specify one from { RAPI_RISING_EDGE, RAPI_FALLING_EDGE, RAPI_BOTH_EDGE }. The default value is RAPI_RISING_EDGE. Note: When RAPI_MP1 is specified for the count source, count edge is fixed to the default value.
(Count clearing source)	Specify one from { RAPI_TCNT_CLEAR_TGRA, RAPI_TCNT_CLEAR_TGRB }. The default value is RAPI_TCNT_CLEAR_DIS.
(A/D converter start request)	Specify one from { RAPI_AD_START_REQ, RAPI_NO_AD_START_REQ }. The default value is RAPI_NO_AD_START_REQ.

- **Selectable parameters when RAPI_MTU2_2 is specified:**

(Count source)	Specify one from { RAPI_MP1, RAPI_MP4, RAPI_MP16, RAPI_MP64, RAPI_MP1024_2, RAPI_EXTER_TCLKA_0, RAPI_EXTER_TCLKB_0, RAPI_EXTER_TCLKC_0 }. The default value is RAPI_MP1.
(Count edge)	Specify one from { RAPI_RISING_EDGE, RAPI_FALLING_EDGE, RAPI_BOTH_EDGE }. The default value is RAPI_RISING_EDGE. Note: When RAPI_MP_1 is specified for the count source, count edge is fixed to its default value.
(Count clearing source)	Specify one from { RAPI_TCNT_CLEAR_TGRA, RAPI_TCNT_CLEAR_TGRB }. The default value is RAPI_TCNT_CLEAR_DIS.
(A/D converter start request)	Specify one from { RAPI_AD_START_REQ, RAPI_NO_AD_START_REQ }. The default value is RAPI_NO_AD_START_REQ.

Description (3/3)

- **Selectable parameters when RAPI_MTU2_3 or RAPI_MTU2_4 is specified:**

(Count source)	Specify one from { RAPI_MP1, RAPI_MP4, RAPI_MP16, RAPI_MP64, RAPI_MP256_34, RAPI_MP1024_34, RAPI_EXTER_TCLKA_3, RAPI_EXTER_TCLKB_3 }. The default value is RAPI_MP1.
(Count edge)	Specify one from { RAPI_RISING_EDGE, RAPI_FALLING_EDGE, RAPI_BOTH_EDGE }. The default value is RAPI_RISING_EDGE. Note: When RAPI_MP1 is specified for the count source, count edge is fixed to its default value.
(Count clearing source)	Specify one from { RAPI_TCNT_CLEAR_TGRA, RAPI_TCNT_CLEAR_TGRB, RAPI_TCNT_CLEAR_TGRC, RAPI_TCNT_CLEAR_TGRD }. The default value is RAPI_TCNT_CLEAR_DIS.
(A/D converter start request)	Specify one from { RAPI_AD_START_REQ, RAPI_NO_AD_START_REQ }. The default value is RAPI_NO_AD_START_REQ.

- **Parameters when synchronous operation is specified:**
  When setting synchronous operation for any channels 0 to 4, specify RAPI_TIMER_SYNC.
  When not setting synchronous operation (each channel operates independently), specify RAPI_TIMER_NO_SYNC.
  The default value is RAPI_TIMER_NO_SYNC.

Return value

If the specification of timer is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

Timer MTU2 (output compare mode)

Reference

__CreatePWM

Remark

If an undefined value is specified in the argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_timer_sh_7125.h"

/* Declaration of callback function */
void TimerIntFunc( void );

void func( void )
{
   /* Setting MTU2 channel 0 for output compare mode */
   __CreateOutputCompare( RAPI_MTU2_0 | RAPI_MP_4 |
          RAPI_FALLING_EDGE | RAPI_TCNT_CLEAR_TGRA |
          RAPI_TIMER_NO_SYNC );
}
```

28) __SetOutputPin

Synopsis

<Setting of timer general register for output compare>

Boolean __SetOutputPin(unsigned long data1, unsigned short data2, void *func)

data1	Setup data 1
data2	Setup data 2
func	Pointer to callback function

Description (1/2)

Sets the timer general register of the specified channel for output compare.

[data1]

For data1, set the following parameters. To set multiple parameters at the same time, use the symbol "|" to separate each specified parameter.

RAPI_MTU2_0	MTU2 channel 0
RAPI_MTU2_1	MTU2 channel 1
RAPI_MTU2_2	MTU2 channel 2
RAPI_MTU2_3	MTU2 channel 3
RAPI_MTU2_4	MTU2 channel 4
RAPI_TGRA	Timer General Register A
RAPI_TGRB	Timer General Register B
RAPI_TGRC	Timer General Register C
RAPI_TGRD	Timer General Register D
RAPI_OUTPUT_RETAIN	Output retained
RAPI_OUTPUT_0_0	Initial output is 0, 0 output at compare match
RAPI_OUTPUT_0_1	Initial output is 0, 1 output at compare match
RAPI_OUTPUT_0_TOG	Initial output is 0, toggle output at compare match
RAPI_OUTPUT_1_0	Initial output is 1, 0 output at compare match
RAPI_OUTPUT_1_1	Initial output is 1, 1 output at compare match
RAPI_OUTPUT_1_TOG	Initial output is 1, toggle output at compare match
RAPI_COMPARE_MATCH_ENA	Enables compare match interrupt
RAPI_COMPARE_MATCH_DIS	Disables compare match interrupt
RAPI_TIMER_INT_LV_0	Interrupt priority level 0
RAPI_TIMER_INT_LV_1	Interrupt priority level 1
RAPI_TIMER_INT_LV_2	Interrupt priority level 2
RAPI_TIMER_INT_LV_3	Interrupt priority level 3
RAPI_TIMER_INT_LV_4	Interrupt priority level 4
RAPI_TIMER_INT_LV_5	Interrupt priority level 5
RAPI_TIMER_INT_LV_6	Interrupt priority level 6
RAPI_TIMER_INT_LV_7	Interrupt priority level 7
RAPI_TIMER_INT_LV_8	Interrupt priority level 8
RAPI_TIMER_INT_LV_9	Interrupt priority level 9
RAPI_TIMER_INT_LV_10	Interrupt priority level 10
RAPI_TIMER_INT_LV_11	Interrupt priority level 11
RAPI_TIMER_INT_LV_12	Interrupt priority level 12
RAPI_TIMER_INT_LV_13	Interrupt priority level 13
RAPI_TIMER_INT_LV_14	Interrupt priority level 14
RAPI_TIMER_INT_LV_15	Interrupt priority level 15

Description (2/2)

- **Selectable parameters when RAPI_MTU2_0, RAPI_MTU2_3, or RAPI_MTU2_4 is specified:**

  (Timer general register) Specify one from { RAPI_TGRA, RAPI_TGRB, RAPI_TGRC, RAPI_TGRD }.

  (Count output) Specify one from { RAPI_OUTPUT_RETAIN, RAPI_OUTPUT_0_0, RAPI_OUTPUT_0_1, RAPI_OUTPUT_0_TOG, RAPI_OUTPUT_1_0, RAPI_OUTPUT_1_1, RAPI_OUTPUT_1_TOG }. The default value is RAPI_OUTPUT_RETAIN.

  (Interrupt enable) Specify one from { RAPI_COMPARE_MATCH_ENA, RAPI_COMPARE_MATCH_DIS }. The default value is RAPI_COMPARE_MATCH_DIS.

  (Interrupt priority level) Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }. The default value is RAPI_TIMER_INT_LV_0.

- **Selectable parameters when RAPI_MTU2_1 or RAPI_MTU2_2 is specified:**

  (Timer general register) Specify one from { RAPI_TGRA, RAPI_TGRB }.

  (Count output) Specify one from { RAPI_OUTPUT_RETAIN, RAPI_OUTPUT_0_0, RAPI_OUTPUT_0_1, RAPI_OUTPUT_0_TOG, RAPI_OUTPUT_1_0, RAPI_OUTPUT_1_1, RAPI_OUTPUT_1_TOG }. The default value is RAPI_OUTPUT_RETAIN.

  (Interrupt enable) Specify one from { RAPI_COMPARE_MATCH_ENA, RAPI_COMPARE_MATCH_DIS }. The default value is RAPI_COMPARE_MATCH_DIS.

  (Interrupt priority level) Specify one from { RAPI_TIMER_INT_LV_0, RAPI_TIMER_INT_LV_1, RAPI_TIMER_INT_LV_2, RAPI_TIMER_INT_LV_3, RAPI_TIMER_INT_LV_4, RAPI_TIMER_INT_LV_5, RAPI_TIMER_INT_LV_6, RAPI_TIMER_INT_LV_7, RAPI_TIMER_INT_LV_8, RAPI_TIMER_INT_LV_9, RAPI_TIMER_INT_LV_10, RAPI_TIMER_INT_LV_11, RAPI_TIMER_INT_LV_12, RAPI_TIMER_INT_LV_13, RAPI_TIMER_INT_LV_14, RAPI_TIMER_INT_LV_15 }. The default value is RAPI_TIMER_INT_LV_0.

[data2]
For data2, specify a 16-bit value for output counter.

[func]
For func, specify a pointer to callback function. If this pointer is not specified, set RAPI_NULL. If retaining the callback function that is already specified, set RAPI_HOLD. Then only value in data2 is changed.

Return value

If the specification of channel is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

Timer MTU2 (output compare mode)

Reference

__EnableOutputCompare, __DestroyOutputCompare

Remark

If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_timer_sh_7125.h"

/* Declaration of callback function */
void TimerIntBFunc( void );
void TimerIntAFunc( void );

void func( void )
{
   /* Setting up TGRB and TGRA of MTU2 channel 1
      to duty register and cycle register, respectively */
   __SetPWMPin( RAPI_MTU2_1 | RAPI_TGRB |RAPI_OUTPUT_0_0 |
         RAPI_COMPARE_MATCH_ENA | RAPI_TIMER_INT_LV_3,
         50000, TimerIntBFunc );
   __SetPWMPin( RAPI_MTU2_1 | RAPI_TGRA | RAPI_OUTPUT_0_1 |
         RAPI_COMPARE_MATCH_ENA | RAPI_TIMER_INT_LV_3,
         30000, TimerIntAFunc );
}
```

29) __EnableOutputCompare

Synopsis

<Operation control for output compare mode>

Boolean __EnableOutputCompare(unsigned long data)

data	Setup data

Description

Controls start/stop operation of the specified timer in output compare mode.

[data]

For data, set the following parameters. To set multiple parameters at the same time, use the symbol "|" to separate each specified parameter. Then several timers can be enabled or disabled at the same time.

RAPI_MTU2_0	MTU2 channel 0
RAPI_MTU2_1	MTU2 channel 1
RAPI_MTU2_2	MTU2 channel 2
RAPI_MTU2_3	MTU2 channel 3
RAPI_MTU2_4	MTU2 channel 4
RAPI_MTU20_4	MTU2 channels 0 to 4
RAPI_TIMER_ON	Starts the timer in output compare mode
RAPI_TIMER_OFF	Stops the timer in output compare mode

Return value

If the specification of timer is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

Timer MTU2 (output compare mode)

Reference

__EnableTimer

Remark

If an undefined value is specified in the argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_timer_sh_7125.h"

void func( void )
{
    /* Start-up timer for MTU2 channels 0 and 1
       in output compare mode */
    __EnableOutputCompare( RAPI_MTU2_0 | RAPI_MTU2_1 | RAPI_TIMER_ON );
}
```

30) __DestroyOutputCompare

Synopsis

<Clearing of setting for output compare mode>

Boolean __DestroyOutputCompare(unsigned long data)

data	Setup data

Description

Clears setting of the specified timer in output compare mode.

[data]

For data, set the following parameters. To set multiple parameters at the same time, use the symbol "|" to separate each specified parameter.

RAPI_MTU2_0	MTU2 channel 0
RAPI_MTU2_1	MTU2 channel 1
RAPI_MTU2_2	MTU2 channel 2
RAPI_MTU2_3	MTU2 channel 3
RAPI_MTU2_4	MTU2 channel 4
RAPI_MTU20_4	MTU2 channels 0 to 4

Return value

If the specification of timer is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

Timer MTU2 (output compare mode)

Reference

__DestroyTimer

Remark

If an undefined value is specified in the argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_timer_sh_7125.h"

void func( void )
{
    /* Clearing settings of MTU2 channels 1 and 2
       in output compare mode */
    __DestroyOutputCompare( RAPI_MTU2_1 | RAPI_MTU2_2 );
}
```

31) __GetTimerFlag

Synopsis

<Acquisition of timer status>

Boolean __GetTimerFlag(unsigned long data1, unsigned char *data2)

data1	Setup data 1
data2	Pointer to the buffer in which counter flag value is stored

Description

Acquires status flags of the specified timer.

[data1]

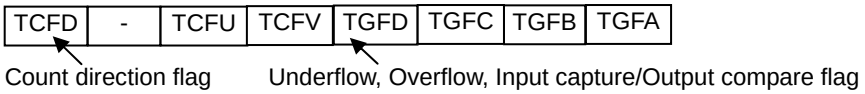
For data1, set the following parameters. To set multiple parameters for flags at the same time, use the symbol "|" to separate each specified parameter.

RAPI_MTU2_0	MTU2 channel 0
RAPI_MTU2_1	MTU2 channel 1
RAPI_MTU2_2	MTU2 channel 2
RAPI_MTU2_3	MTU2 channel 3
RAPI_MTU2_4	MTU2 channel 4
RAPI_MTU2_5U	MTU2 channel 5U
RAPI_MTU2_5V	MTU2 channel 5V
RAPI_MTU2_5W	MTU2 channel 5W
RAPI_CMT_0	CMT channel 0
RAPI_CMT_1	CMT channel 1
RAPI_TGFA	Input capture/Output compare flag A
RAPI_TGFB	Input capture/Output compare flag B
RAPI_TGFC	Input capture/Output compare flag C
RAPI_TGFD	Input capture/Output compare flag D
RAPI_TCFD	Count direction flag
RAPI_TCFV	Overflow flag
RAPI_TCFU	Underflow flag
RAPI_TGFE	Compare match flag E
RAPI_TGFF	Compare match flag F
RAPI_CMF	Compare match/Input capture flag

Note: When MTU2 channel 5U, 5V, or 5W is selected, each compare match/input capture flag (CMFU5, CMFV5, or CMFW5, respectively) is acquired.

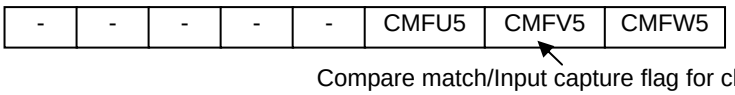
Configuration of the timer status register (TSR), which stores the status flags for timer MTU2 is shown below:

• TSR_0 to TSR_4:



• TSR2_0:

• TSR_5:



Return value

If the specification of timer is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

Timer MTU2

Reference

__ClearTimerFlag

Remark

If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_timer_sh_7125.h"

void func( void )
{
    unsigned char data;

    /* Acquisition of count direction flag and overflow flag
       for MTU2 channel 0 */
    __GetMTU2Flag( RAPI_MTU2_0 | RAPI_TCFV | RAPI_TGFD, &data );
}
```

32) __ClearTimerFlag

Synopsis

<Clearing of timer status>

Boolean __ClearTimerFlag(unsigned long data)

data	Setup data

Description

Clears status flags of the specified timer.

[data]

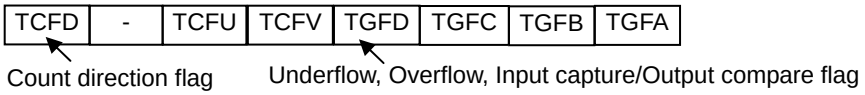
For data, set the following parameters. To clear multiple parameters for flags at the same time, use the symbol "|" to separate each specified parameter.

RAPI_MTU2_0	MTU2 channel 0
RAPI_MTU2_1	MTU2 channel 1
RAPI_MTU2_2	MTU2 channel 2
RAPI_MTU2_3	MTU2 channel 3
RAPI_MTU2_4	MTU2 channel 4
RAPI_MTU2_5U	MTU2 channel 5U
RAPI_MTU2_5V	MTU2 channel 5V
RAPI_MTU2_5W	MTU2 channel 5W
RAPI_CMT_0	CMT channel 0
RAPI_CMT_1	CMT channel 1
RAPI_TGFA	Input capture/Output compare flag A
RAPI_TGFB	Input capture/Output compare flag B
RAPI_TGFC	Input capture/Output compare flag C
RAPI_TGFD	Input capture/Output compare flag D
RAPI_TCFV	Overflow flag
RAPI_TCFU	Underflow flag
RAPI_TGFE	Compare match flag E
RAPI_TGFF	Compare match flag F
RAPI_CMF	Compare match/Input capture flag

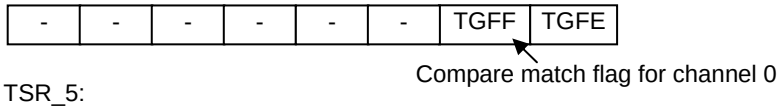
Note: When MTU2 channel 5U, 5V, or 5W is selected, each compare match/input capture flag (CMFU5, CMFV5, or CMFW5, respectively) is cleared.

Configuration of the timer status register (TSR), which stores the status flags for timer MTU2 is shown below:

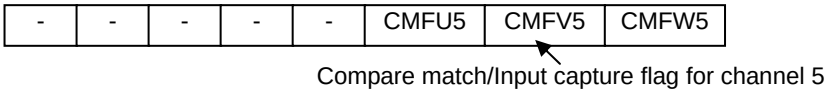
• TSR_0 to TSR_4:



• TSR2_0:



• TSR_5:



Return value

If the specification of timer is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

Timer MTU2

Reference

__GetTimerFlag

Remark

If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_timer_sh_7125.h"

void func( void )
{
    /* Clearing count direction flag and overflow flag
       for MTU2 channel 0 */
    __ClearMTU2Flag( RAPI_MTU2_0 | RAPI_TCFV | RAPI_TGFD );
}
```

4.2.3. I/O Port

1) __SetIOPort

Synopsis

<Setting of I/O port>

Boolean __SetIOPort(unsigned long data)

data	Setup data

Description

Sets the operating condition for the specified I/O port.

[data]

For data, set the following parameters. To set multiple parameters at the same time, use the symbol "|" to separate each specified parameter.

- Port: (Choose one from the following)

RAPI_FUNC_A	Port A
RAPI_FUNC_B_L	Port B with lower 16 bits
RAPI_FUNC_B_H	Port B with higher 16 bits
RAPI_FUNC_E	Port E
RAPI_FUNC_F	Port F

Note: Port F is an input-only port with 8 bits.

- Bit: (Multiple bits can be selected)

RAPI_BIT_0	Bit 0 of the specified port
RAPI_BIT_1	Bit 1 of the specified port
RAPI_BIT_2	Bit 2 of the specified port
RAPI_BIT_3	Bit 3 of the specified port
RAPI_BIT_4	Bit 4 of the specified port
RAPI_BIT_5	Bit 5 of the specified port
RAPI_BIT_6	Bit 6 of the specified port
RAPI_BIT_7	Bit 7 of the specified port
RAPI_BIT_8	Bit 8 of the specified port
RAPI_BIT_9	Bit 9 of the specified port
RAPI_BIT_10	Bit 10 of the specified port
RAPI_BIT_11	Bit 11 of the specified port
RAPI_BIT_12	Bit 12 of the specified port
RAPI_BIT_13	Bit 13 of the specified port
RAPI_BIT_14	Bit 14 of the specified port
RAPI_BIT_15	Bit 15 of the specified port
RAPI_LOWER_8_BITS	Lower 8 bits of the specified port
RAPI_HIGHER_8_BITS	Higher 8 bits of the specified port
RAPI_16_BITS	16 bits of the specified port

- Pin function: (Choose one from the following)

RAPI_FUNC_IO	I/O port
RAPI_FUNC_MTU2	Timer MTU2
RAPI_FUNC_SCI	Serial communication interface
RAPI_FUNC_AD	A/D converter
RAPI_FUNC_POE	Port output enable
RAPI_FUNC_INT	External interrupt

- Port input/output direction: (Choose one from the following)

RAPI_PORT_INPUT	Sets the specified port to input
RAPI_PORT_OUTPUT	Sets the specified port to output

Return value

If the specification of I/O port is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

I/O port

Reference

__ReadIOPort, __WriteIOPort

Remark

If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_io_port_sh_7125.h"

void func( void )
{
    /* Setting Port A with lower 8 bits to port output */
    __SetIOPort( RAPI_PORT_A | RAPI_LOWER_8_BITS | RAPI_FUNC_IO |
          RAPI_PORT_OUTPUT );
}
```

2) __ReadIOPort

Synopsis

<Reading of data from I/O port>

Boolean __ReadIOPort(unsigned long data1, unsigned short *data2)

data1	Setup data 1
data2	Pointer to the variable in which the value read from I/O port is stored.

Description

Acquires value of the specified I/O port.

[data1]

For data1, set the following parameters. To set multiple parameters at the same time, use the symbol "|" to separate each specified parameter.

- Port: (Choose one from the following)

RAPI_FUNC_A	Port A
RAPI_FUNC_B_L	Port B with lower 16 bits
RAPI_FUNC_B_H	Port B with higher 16 bits
RAPI_FUNC_E	Port E
RAPI_FUNC_F	Port F

Note: Port F is an input-only port with 8 bits.

- Bit: (Multiple bits can be selected)

RAPI_BIT_0	Bit 0 of the specified port
RAPI_BIT_1	Bit 1 of the specified port
RAPI_BIT_2	Bit 2 of the specified port
RAPI_BIT_3	Bit 3 of the specified port
RAPI_BIT_4	Bit 4 of the specified port
RAPI_BIT_5	Bit 5 of the specified port
RAPI_BIT_6	Bit 6 of the specified port
RAPI_BIT_7	Bit 7 of the specified port
RAPI_BIT_8	Bit 8 of the specified port
RAPI_BIT_9	Bit 9 of the specified port
RAPI_BIT_10	Bit 10 of the specified port
RAPI_BIT_11	Bit 11 of the specified port
RAPI_BIT_12	Bit 12 of the specified port
RAPI_BIT_13	Bit 13 of the specified port
RAPI_BIT_14	Bit 14 of the specified port
RAPI_BIT_15	Bit 15 of the specified port
RAPI_LOWER_8_BITS	Lower 8 bits of the specified port
RAPI_HIGHER_8_BITS	Higher 8 bits of the specified port
RAPI_16_BITS	16 bits of the specified port

- Access size for data read: (Choose one from the following)

RAPI_BITS_OPE	Bit handling mode
RAPI_BYTE_OPE	Byte handling mode
RAPI_WORD_OPE	Word handling mode

- Register for reading: (Choose one from the following)

RAPI_DATA_REGISTER	Register for storing data (Data register)
RAPI_PORT_REGISTER	Register for reading the pin state (Port register)

• Selectable parameters when Port F is specified:
Port F is an input-only port with 8 bits. Only RAPI_DATA_REGISTER can be selected.

Return value

If the specification of I/O port is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

I/O port

Reference

__SetIOPort, __WriteIOPort

Remark

If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_io_port_sh_7125.h"

unsigned short data[2];

void func( void )
{
   /* Acquisition of the value of bits 1 and 3 for Port A */
   __ReadIOPort( RAPI_FUNC_A | RAPI_BIT_1 | RAPI_BIT_3 |
         RAPI_PORT_REGISTER | RAPI_BITS_OPE, data );
}
```

3) __WriteIOPort

Synopsis

<Writing of data to I/O port>

Boolean __WriteIOPort(unsigned long data1, unsigned short data2)

data1	Setup data 1
data2	Data to be written to I/O port

Description (1/2)

Writes data to the specified I/O port.

[data1]

For data1, set the following parameters. To set multiple parameters at the same time, use the symbol "|" to separate each specified parameter.

- Port: (Choose one from the following)

RAPI_FUNC_A	Port A
RAPI_FUNC_B_L	Port B with lower 16 bits
RAPI_FUNC_B_H	Port B with higher 16 bits
RAPI_FUNC_E	Port E
RAPI_FUNC_F	Port F

- Bit: (Multiple bits can be selected)

RAPI_BIT_0	Bit 0 of the specified port
RAPI_BIT_1	Bit 1 of the specified port
RAPI_BIT_2	Bit 2 of the specified port
RAPI_BIT_3	Bit 3 of the specified port
RAPI_BIT_4	Bit 4 of the specified port
RAPI_BIT_5	Bit 5 of the specified port
RAPI_BIT_6	Bit 6 of the specified port
RAPI_BIT_7	Bit 7 of the specified port
RAPI_BIT_8	Bit 8 of the specified port
RAPI_BIT_9	Bit 9 of the specified port
RAPI_BIT_10	Bit 10 of the specified port
RAPI_BIT_11	Bit 11 of the specified port
RAPI_BIT_12	Bit 12 of the specified port
RAPI_BIT_13	Bit 13 of the specified port
RAPI_BIT_14	Bit 14 of the specified port
RAPI_BIT_15	Bit 15 of the specified port
RAPI_LOWER_8_BITS	Lower 8 bits of the specified port
RAPI_HIGHER_8_BITS	Higher 8 bits of the specified port
RAPI_16_BITS	16 bits of the specified port

- Access size for data read: (Choose one from the following)

RAPI_BITS_OPE	Bit handling mode
RAPI_BYTE_OPE	Byte handling mode
RAPI_WORD_OPE	Word handling mode

Description (2/2)

[data2]
For data2, specify the value to be written to I/O port.

- **Selectable parameters when RAPI_BITS_OPE is specified: (Choose one from the following)**

RAPI_L	Writes 0 to one or several bits
RAPI_H	Writes 1 to one or several bits

Note: When specifying RAPI_BITS_OPE, the same value (RAPI_L or RAPI_H) is written to all the specified bits.

- **Assignable value when RAPI_BYTE_OPE or RAPI_WORD_OPE is specified:**
  Set the value to be written to the specified port by byte or word size.

Return value

If the specification of I/O port is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

I/O port

Reference

__SetIOPort, __ReadIOPort

Remark

If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_io_port_sh_7125.h"

void func( void )
{
   /* Writing data to lower 8 bits of Port A */
   __WriteIOPort( RAPI_PORT_A | RAPI_LOWER_8_BITS | RAPI_BYTE_OPE, 0xAA );
}
```

4.2.4. External Interrupt

1) __CreateInterrupt

Synopsis

<Setting of external interrupt>

Boolean __CreateInterrupt(unsigned long data, void *func)

data	Setup data
func	Pointer to callback function

Description (1/2)

Sets the specified external interrupt.

[data]

For data, set the following parameters. To set multiple parameters at the same time, use the symbol "|" to separate each specified parameter. Note that multiple external interrupts cannot be specified at the same time.

RAPI_NMI	NMI interrupt
RAPI_IRQ0	IRQ0 interrupt
RAPI_IRQ1	IRQ1 interrupt
RAPI_IRQ2	IRQ2 interrupt
RAPI_IRQ3	IRQ3 interrupt
RAPI_INT_LOW	Interrupt request is detected at the low level
RAPI_INT_FALLING	Interrupt request is detected at the falling edge
RAPI_INT_RISING	Interrupt request is detected at the rising edge
RAPI_INT_BOTH	Interrupt request is detected at the both edges
RAPI_IRQOUT_INT_OUTPUT	Outputs detection signal for interrupt request (IRQOUT)
RAPI_IRQOUT_HIGH_LEVEL	Does not output detection signal for interrupt request (IRQOUT)
RAPI_INT_LV_0	Interrupt priority level 0
RAPI_INT_LV_1	Interrupt priority level 1
RAPI_INT_LV_2	Interrupt priority level 2
RAPI_INT_LV_3	Interrupt priority level 3
RAPI_INT_LV_4	Interrupt priority level 4
RAPI_INT_LV_5	Interrupt priority level 5
RAPI_INT_LV_6	Interrupt priority level 6
RAPI_INT_LV_7	Interrupt priority level 7
RAPI_INT_LV_8	Interrupt priority level 8
RAPI_INT_LV_9	Interrupt priority level 9
RAPI_INT_LV_10	Interrupt priority level 10
RAPI_INT_LV_11	Interrupt priority level 11
RAPI_INT_LV_12	Interrupt priority level 12
RAPI_INT_LV_13	Interrupt priority level 13
RAPI_INT_LV_14	Interrupt priority level 14
RAPI_INT_LV_15	Interrupt priority level 15

Description (2/2)

- **Selectable parameters when IRQ0 to IRQ3 interrupts (RAPI_IRQ0 to RAPI_IRQ3) are specified:**

(Polarity sense)	Specify one from { RAPI_INT_LOW, RAPI_INT_FALLING, RAPI_INT_RISING, RAPI_INT_BOTH}. The default value is RAPI_INT_LOW.
(IRQOUT signal output)	Specify one from { RAPI_IRQOUT_INT_OUTPUT, RAPI_IRQOUT_HIGH_LEVEL }. The default value is RAPI_IRQOUT_INT_OUTPUT.
(Interrupt priority level)	Specify one from { RAPI_INT_LV_0, RAPI_INT_LV_1, RAPI_INT_LV_2, RAPI__INT_LV_3, RAPI_INT_LV_4, RAPI_INT_LV_5, RAPI_INT_LV_6, RAPI_INT_LV_7, RAPI_INT_LV_8, RAPI_INT_LV_9, RAPI_INT_LV_10, RAPI_INT_LV_11, RAPI_INT_LV_12, RAPI_INT_LV_13, RAPI_INT_LV_14, RAPI_INT_LV_15 }. The default value is RAPI_INT_LV_0.

- **Selectable parameters when NMI interrupt (RAPI_NMI) is specified:**

(Polarity sense)	Specify one from { RAPI_INT_FALLING, RAPI_INT_RISING}. The default value is RAPI_INT_FALLING.
(IRQOUT signal output)	Specify one from { RAPI_IRQOUT_INT_OUTPUT, RAPI_IRQOUT_HIGH_LEVEL }. The default value is RAPI_IRQOUT_INT_OUTPUT.
(Interrupt priority level)	The interrrupt priority level of NMI is fixed to 16 and cannot be set.

[func]
For func, specify a pointer to callback function. If this pointer is not specified, set RAPI_NULL.

Return value

If the specification of external interrupt is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

External interrupt

Reference

__EnableInterrupt, __GetInterruptAndPinInfo, __ClearInterruptFlag

Remark

- The interrupt priority level specified in this API is set to the interrupt priority register (IPR) only after execution of __EnableInterrupt specifying RAPI_IRQ_ENA.
- If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_interrupt_sh_7125.h"

/* Declaration of callback function */
void IntFunc( void );

void func( void )
{
   /* Setting IRQ0 interrupt */
   __CreateInterrupt( RAPI_IRQ0 | RAPI_INT_FALLING |
         RAPI_IRQOUT_INT_OUTPUT | RAPI_INT_LV_7, IntFunc );
}
```

2) __EnableInterrupt

Synopsis

<Operation control for external interrupt>
Boolean __EnableInterrupt(unsigned long data)

data	Setup data

Description

Controls the operating condition of the specified external interrupt.

[data]
For data, set the following parameters. To set multiple parameters at the same time, use the symbol "|" to separate each specified parameter.

RAPI_IRQ0	IRQ0 interrupt
RAPI_IRQ1	IRQ1 interrupt
RAPI_IRQ2	IRQ2 interrupt
RAPI_IRQ3	IRQ3 interrupt
RAPI_INT_REQUEST_CLEAR	Clears the status flag of IRQ*i* interrupt request (*i* = 0 to 3) (it is invalid if the low-level detection is set)
RAPI_INT_REQUEST_REMAIN	Retains the status flag of IRQ*i* interrupt request (*i* = 0 to 3) (it is invalid if the low-level detection is set)
RAPI_IRQ_DIS	Disables interrupt
RAPI_IRQ_ENA	Enables interrupt

Return value

If the specification of external interrupt is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

External interrupt

Reference

__CreateInterrupt, __GetInterruptAndPinInfo, __ClearInterruptFlag

Remark

- The Interrupt priority level specified in __CreateInterrupt is set to the interrupt priority register (IPR) after execution of this API specifying RAPI_IRQ_ENA.
- If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_interrupt_sh_7125.h"

void func( void )
{
   /* Enabling IRQ1 interrupt */
   __EnableInterrupt( RAPI_IRQ1 | RAPI_INT_REQUEST_CLEAR |
       RAPI_IRQ_ENA );
}
```

3) __GetInterruptAndPinInfo

Synopsis

<Acquisition of input-pin level for external interrupt, and the status of interrupt request>

Boolean __GetInterruptAndPinInfo(unsigned long data1, unsigned char *data2)

data1	Setup data 1
data2	Pointer to the buffer in which input pin level and status flag are stored

Description

Acquires input-pin level and status flag of interrupt request for the specified external interrupt.

[data1]

For data1, set the following parameters. To read multiple IRQ*i* input-pin levels or multiple status flags for IRQ*i* interrupt request (*i* = 0 to 3), use the symbol "|" to separate each specified parameter.

RAPI_NMI_PIN	Input-pin level for NMI
RAPI_IRQ0_PIN	Input-pin level for IRQ0
RAPI_IRQ1_PIN	Input-pin level for IRQ1
RAPI_IRQ2_PIN	Input-pin level for IRQ2
RAPI_IRQ3_PIN	Input-pin level for IRQ3
RAPI_IRQ0_FLAG	Status flag for IRQ0 interrupt request
RAPI_IRQ1_FLAG	Status flag for IRQ1 interrupt request
RAPI_IRQ2_FLAG	Status flag for IRQ2 interrupt request
RAPI_IRQ3_FLAG	Status flag for IRQ3 interrupt request

• Configuration of the IRQ status register (IRQSR):

1	1	1	1	IRQ3L	IRQ2L	IRQ1L	IRQ0L	0	0	0	0	IRQ3F	IRQ2F	IRQ1F	IRQ0F

Input-pin level for IRQ*i* (*i* = 0 to 3) (0: low; 1: high)

Status flag for interrupt request (0: Interrupt not requested; 1: Interrupt requested)

• Configuration of the Interrupt control register 0 (ICR0):

NMIL	0	0	0	0	0	0	NMIE	0	0	0	0	0	0	0	0

Input-pin level for NMI (0: low; 1: high)

Return value

If the specification of external interrupt is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

External interrupt

Reference

__CreateInterrupt, __EnableInterrupt, __ClearInterruptFlag

Remark

If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_interrupt_sh_7125.h"

void func( void )
{
   unsigned char irq[8];
   unsigned char nmi;

   /* Acquisition of status flags of interrupt request and
      pin states for IRQ0 to IRQ3 */
   __GetInterruptAndPinInfo( RAPI_IRQ0_FLAG | RAPI_IRQ0_PIN |
         RAPI_IRQ1_FLAG | RAPI_IRQ1_PIN | RAPI_IRQ2_FLAG |
         RAPI_IRQ2_PIN | RAPI_IRQ3_FLAG | RAPI_IRQ3_PIN, irq );

   /* Acquisition of pin state for NMI */
   __GetInterruptAndPinInfo( RAPI_NMI_PIN, &nmi );
}
```

4) __ClearInterruptFlag

Synopsis

<Clearing of status of interrupt request>

Boolean __ClearInterruptFlag(unsigned long data)

data	Setup data

Description

Clears status flag of interrupt request for the specified external interrupt.

[data]

For data, set the following parameters. To clear multiple status flags for IRQ*i* interrupt request (*i* = 0 to 3), use the symbol "|" to separate each specified parameter.

RAPI_IRQ0_FLAG	Status flag for IRQ0 interrupt request
RAPI_IRQ1_FLAG	Status flag for IRQ1 interrupt request
RAPI_IRQ2_FLAG	Status flag for IRQ2 interrupt request
RAPI_IRQ3_FLAG	Status flag for IRQ3 interrupt request

Return value

If the specification of external interrupt is invalid, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

Category

External interrupt

Reference

__CreateInterrupt, __EnableInterrupt, __GetInterruptAndPinInfo

Remark

If an undefined value is specified in the argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_interrupt_sh_7125.h"

void func( void )
{
   /* Clearing status flags of interrupt request for IRQ0 to IRQ3 */
   __ClearInterruptFlag( RAPI_IRQ0_FLAG | RAPI_IRQ1_FLAG |
          RAPI_IRQ2_FLAG | RAPI_IRQ3_FLAG );
}
```

4.2.5. A/D Converter

1) __CreateADC

Synopsis

<Setting of A/D converter>

Boolean __CreateADC(unsigned long data, void *func)

data	Setup data
func	Pointer to callback function

Description (1/6)

Sets the operating condition for A/D converter.

[data]

For data, set the following parameters. To set multiple parameters at the same time, use the symbol "|" to separate each specified parameter. Note that multiple analog input pins cannot be specified at the same time.

RAPI_SINGLE	Single mode
RAPI_4CHANNEL_SCAN	4-channel scan mode
RAPI_2CHANNEL_SCAN	2-channel scan mode
RAPI_SINGLE_CYCLE	Single-cycle scan mode
RAPI_CONTINUOUS	Continuous scan mode
RAPI_AN0	Analog input pin 0
RAPI_AN1	Analog input pin 1
RAPI_AN2	Analog input pin 2
RAPI_AN3	Analog input pin 3
RAPI_AN4	Analog input pin 4
RAPI_AN5	Analog input pin 5
RAPI_AN6	Analog input pin 6
RAPI_AN7	Analog input pin 7
RAPI_AN0_AN1	Analog input pins 0 and 1
RAPI_AN0_AN2	Analog input pins 0 to 2
RAPI_AN0_AN3	Analog input pins 0 to 3
RAPI_AN4_AN5	Analog input pins 4 and 5
RAPI_AN4_AN6	Analog input pins 4 to 6
RAPI_AN4_AN7	Analog input pins 4 to 7
RAPI_AN2_AN3	Analog input pins 2 and 3
RAPI_AN6_AN7	Analog input pins 6 and 7
RAPI_50_STATES	State control: Conversion time = 50 states
RAPI_64_STATES	State control: Conversion time = 64 states
RAPI_P_4	Pϕ/4 clock
RAPI_P_3	Pϕ/3 clock
RAPI_P_2	Pϕ/2 clock
RAPI_P_1	Pϕ clock (for Pϕ ≤ 25 MHz)
RAPI_TRIGGER_ENA	Enables A/D conversion triggering by ADTRG or MTU2 trigger
RAPI_TRIGGER_DIS	Disables A/D conversion triggering by ADTRG or MTU2 trigger
RAPI_ADF_SOURCE_OR	When group 0 or group 1 trigger completed A/D conversion, the A/D end flag (ADF) is set. (It is valid only when A/D conversion triggering is enabled in 2-channel scan mode)
RAPI_ADF_SOURCE_AND	When group 0 and group 1 triggers have completed A/D conversion, the ADF is set. (It is valid only when A/D conversion triggering is enabled in 2-channel scan mode) Note that the order of the triggers has no effect on the ADF setting.

Description (2/6)

RAPI_AD_INT_ENA	Enables A/D interrupt
RAPI_AD_INT_DIS	Disables A/D interrupt
RAPI_EXTERNAL_TRIGGER_G0	External trigger pin (ADTRG) input
RAPI_TGRA_TCNT4_TRIGGER_G0	TGRA input capture/compare match for each MTU2 channel or TCNT_4 underflow (trough) in complementary PWM mode (TRGAN)
RAPI_TGRA_MTU2_CHANNEL0_G0	MTU2 channel 0 compare match (TRG0N)
RAPI_MTU2_TRG4AN_G0	MTU2 A/D conversion start request delaying (TRG4AN)
RAPI_MTU2_TRG4BN_G0	MTU2 A/D conversion start request delaying (TRG4BN)
RAPI_EXTERNAL_TRIGGER_G1	External trigger pin (ADTRG) input (for group 1 in 2-channel scan mode)
RAPI_TGRA_TCNT4_TRIGGER_G1	TGRA input capture/compare match for each MTU2 channel or TCNT_4 underflow (trough) in complementary PWM mode (for group 1 in 2-channel scan mode)
RAPI_TGRA_MTU2_CHANNEL0_G1	MTU2 channel 0 compare match (TRG0N) (for group 1 in 2-channel scan mode)
RAPI_MTU2_TRG4AN_G1	MTU2 A/D conversion start request delaying (TRG4AN) (for group 1 in 2-channel scan mode)
RAPI_MTU2_TRG4BN_G1	MTU2 A/D conversion start request delaying (TRG4BN) (for group 1 in 2-channel scan mode)
Note: Parameters for trigger with a '_G0' suffix are specified for group 0 in single mode, 4-channel scan mode, and 2-channel scan mode. Parameters with a '_G1' suffix are specified for group 1 in 2-channel scan mode.	
RAPI_ADC_INT_LV_0	Interrupt priority level 0
RAPI_ADC_INT_LV_1	Interrupt priority level 1
RAPI_ADC_INT_LV_2	Interrupt priority level 2
RAPI_ADC_INT_LV_3	Interrupt priority level 3
RAPI_ADC_INT_LV_4	Interrupt priority level 4
RAPI_ADC_INT_LV_5	Interrupt priority level 5
RAPI_ADC_INT_LV_6	Interrupt priority level 6
RAPI_ADC_INT_LV_7	Interrupt priority level 7
RAPI_ADC_INT_LV_8	Interrupt priority level 8
RAPI_ADC_INT_LV_9	Interrupt priority level 9
RAPI_ADC_INT_LV_10	Interrupt priority level 10
RAPI_ADC_INT_LV_11	Interrupt priority level 11
RAPI_ADC_INT_LV_12	Interrupt priority level 12
RAPI_ADC_INT_LV_13	Interrupt priority level 13
RAPI_ADC_INT_LV_14	Interrupt priority level 14
RAPI_ADC_INT_LV_15	Interrupt priority level 15

Description (3/6)

- **Selectable parameters when single mode (RAPI_SINGLE) is specified:**

(Analog input pin)	Specify one from { RAPI_AN0, RAPI_AN1, RAPI_AN2, RAPI_AN3, RAPI_AN4, RAPI_AN5, RAPI_AN6, RAPI_AN7 }. The default value is RAPI_AN0 (for A/D module 0) or RAPI_AN4 (for A/D module 1).
(State control)	Specify one from { RAPI_50_STATES, RAPI_64_STATES }. The default value is RAPI_50_STATES.
(Clock select)	Specify one from { RAPI_P_4, RAPI_P_3, RAPI_P_2, RAPI_P_1 }. The default value is RAPI_P_4.
(Trigger enable)	Specify one from { RAPI_TRIGGER_ENA, RAPI_TRIGGER_DIS }. The default value is RAPI_TRIGGER_DIS.
(Trigger source)	Specify one from { RAPI_EXTERNAL_TRIGGER_G0, RAPI_TGRA_TCNT4_TRIGGER_G0, RAPI_TGRA_MTU2_CHANNEL0_G0, RAPI_MTU2_TRG4AN_G0, RAPI_MTU2_TRG4BN_G0 }. The default value is RAPI_EXTERNAL_TRIGGER_G0.
(Interrupt enable)	Specify one from { RAPI_AD_INT_ENA, RAPI_AD_INT_DIS }. The default value is RAPI_AD_INT_DIS.
(Interrupt priority level)	Specify one from { RAPI_ADC_INT_LV_0, RAPI_ADC_INT_LV_1, RAPI_ADC_INT_LV_2, RAPI_ADC_INT_LV_3, RAPI_ADC_INT_LV_4, RAPI_ADC_INT_LV_5, RAPI_ADC_INT_LV_6, RAPI_ADC_INT_LV_7, RAPI_ADC_INT_LV_8, RAPI_ADC_INT_LV_9, RAPI_ADC_INT_LV_10, RAPI_ADC_INT_LV_11, RAPI_ADC_INT_LV_12, RAPI_ADC_INT_LV_13, RAPI_ADC_INT_LV_14, RAPI_ADC_INT_LV_15 }. The default value is RAPI_ADC_INT_LV_0.

Description (4/6)

- **Selectable parameters when 4-channel scan mode (RAPI_4CHANNEL_SCAN) is specified:**

(Analog input pin)	Specify one from { RAPI_AN0, RAPI_AN0_AN1, RAPI_AN0_AN2, RAPI_AN0_AN3, RAPI_AN4, RAPI_AN4_AN5, RAPI_AN4_AN6, RAPI_AN4_AN7 }. The default value is RAPI_AN0 (for A/D module 0) or RAPI_AN4 (for A/D module 1).
(State control)	Specify one from { RAPI_50_STATES, RAPI_64_STATES }. The default value is RAPI_50_STATES.
(Clock select)	Specify one from { RAPI_P_4, RAPI_P_3, RAPI_P_2, RAPI_P_1 }. The default value is RAPI_P_4.
(Scan setting)	Specify one from { RAPI_SINGLE_CYCLE, RAPI_CONTINUOUS }. The default value is RAPI_SINGLE_CYCLE.
(Trigger enable)	Specify one from { RAPI_TRIGGER_ENA, RAPI_TRIGGER_DIS }. The default value is RAPI_TRIGGER_DIS.
(Trigger source)	Specify one from { RAPI_EXTERNAL_TRIGGER_G0, RAPI_TGRA_TCNT4_TRIGGER_G0, RAPI_TGRA_MTU2_CHANNEL0_G0, RAPI_MTU2_TRG4AN, RAPI_MTU2_TRG4BN_G0 }. The default value is RAPI_EXTERNAL_TRIGGER_G0.
(Interrupt enable)	Specify one from { RAPI_AD_INT_ENA, RAPI_AD_INT_DIS }. The default value is RAPI_AD_INT_DIS.
(Interrupt priority level)	Specify one from { RAPI_ADC_INT_LV_0, RAPI_ADC_INT_LV_1, RAPI_ADC_INT_LV_2, RAPI_ADC_INT_LV_3, RAPI_ADC_INT_LV_4, RAPI_ADC_INT_LV_5, RAPI_ADC_INT_LV_6, RAPI_ADC_INT_LV_7, RAPI_ADC_INT_LV_8, RAPI_ADC_INT_LV_9, RAPI_ADC_INT_LV_10, RAPI_ADC_INT_LV_11, RAPI_ADC_INT_LV_12, RAPI_ADC_INT_LV_13, RAPI_ADC_INT_LV_14, RAPI_ADC_INT_LV_15 }. The default value is RAPI_ADC_INT_LV_0.

Description (5/6)

- **Selectable parameters when 2-channel scan mode (RAPI_2CHANNEL_SCAN) is specified:**

(Analog input pin) Specify one from { RAPI_AN0, RAPI_AN0_AN1, RAPI_AN2, RAPI_AN2_AN3, RAPI_AN4, RAPI_AN4_AN5, RAPI_AN6, RAPI_AN6_AN7 }.
The default value is RAPI_AN0 (for A/D module 0) or RAPI_AN4 (for A/D module 1).

Note: When using trigger in 2-channel scan mode (Trigger enable: RAPI_TRIGGER_ENA), the specification of analog input pin for group 1 (RAPI_AN2, RAPI_AN2_AN3, RAPI_AN6, or RAPI_AN6_AN7) cannot be guaranteed. Therefore if selecting only group 1, specify analog input pin for group 0 (RAPI_AN0, RAPI_AN0_AN1, RAPI_AN4, or RAPI_AN4_AN5).
Then each corresponding pin for group 1 is also valid.

(State control) Specify one from { RAPI_50_STATES, RAPI_64_STATES }.
The default value is RAPI_50_STATES.

(Clock select) Specify one from { RAPI_P_4, RAPI_P_3, RAPI_P_2, RAPI_P_1 }. The default value is RAPI_P_4.

(Scan setting) Specify one from { RAPI_SINGLE_CYCLE, RAPI_CONTINUOUS }.
The default value is RAPI_SINGLE_CYCLE.

(Trigger enable) Specify one from { RAPI_TRIGGER_ENA, RAPI_TRIGGER_DIS }.
The default value is RAPI_TRIGGER_DIS.

(Trigger source)
- For group 0, specify one from { RAPI_EXTERNAL_TRIGGER_G0, RAPI_TGRA_TCNT4_TRIGGER_G0, RAPI_TGRA_MTU2_CHANNEL0_G0, RAPI_MTU2_TRG4AN_G0, RAPI_MTU2_TRG4BN_G0}.
  The default value is RAPI_EXTERNAL_TRIGGER_G0.
- For group 1, specify one from { RAPI_EXTERNAL_TRIGGER_G1, RAPI_TGRA_TCNT4_TRIGGER_G1, RAPI_TGRA_MTU2_CHANNEL0_G1, RAPI_MTU2_TRG4AN_G1, RAPI_MTU2_TRG4BN_G1 }.
  The default value is RAPI_EXTERNAL_TRIGGER_G1.

Note: For groups 0 and 1, specify different triggers respectively.

(ADF control) Specify one from { RAPI_ADF_SOURCE_OR, RAPI_ADF_SOURCE_AND }.
The default value is RAPI_ADF_SOURCE_OR.

(Interrupt enable) Specify one from { RAPI_AD_INT_ENA, RAPI_AD_INT_DIS }.
The default value is RAPI_AD_INT_DIS.

(Interrupt priority level) Specify one from { RAPI_ADC_INT_LV_0, RAPI_ADC_INT_LV_1, RAPI_ADC_INT_LV_2, RAPI_ADC_INT_LV_3, RAPI_ADC_INT_LV_4, RAPI_ADC_INT_LV_5, RAPI_ADC_INT_LV_6, RAPI_ADC_INT_LV_7, RAPI_ADC_INT_LV_8, RAPI_ADC_INT_LV_9, RAPI_ADC_INT_LV_10, RAPI_ADC_INT_LV_11, RAPI_ADC_INT_LV_12, RAPI_ADC_INT_LV_13, RAPI_ADC_INT_LV_14, RAPI_ADC_INT_LV_15 }.
The default value is RAPI_ADC_INT_LV_0.

Description (6/6)

[func]
For func, specify a pointer to callback function. If this pointer is not specified, set RAPI_NULL.

Return value

If A/D converter is successfully set, RAPI_TRUE is returned; if failed, RAPI_FALSE is returned.

Category

A/D converter

Reference

__EnableADC, __DestroyADC, __GetADC

Remark

If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_ad_sh_7125.h"

/* Declaration of callback function */
void AdIntFunc( void );

void func( void )
{
   /* Setting A/D converter for single mode */
   __CreateADC( RAPI_SINGLE | RAPI_AN2 | RAPI_50_STATE |
         RAPI_P_2 | RAPI_TRIGGER_ENA | RAPI_AD_INT_ENA |
          RAPI_EXTERNAL_TRIGGER_G1 | RAPI_ADC_INT_LV_5, AdIntFunc );
}
```

2) __EnableADC

Synopsis

<Operation control for A/D converter>

Boolean __EnableADC(unsigned long data)

data	Setup data

Description

Controls start/stop operation of the specified A/D converter.

[data]

For data, set the following parameters. To set multiple parameters at the same time, use the symbol "|" to separate each specified parameter. (Refer to note below.)

RAPI_AD_0	A/D module 0
RAPI_AD_1	A/D module 1
RAPI_AD_ON	Sets the A/D converter to start operation
RAPI_AD_OFF	Sets the A/D converter to stop operation

Note: Both A/D modules 0 and 1 (RAPI_AD_0 and RAPI_AD_1) cannot be selected at the same time.

Return value

If A/D converter is successfully controlled, RAPI_TRUE is returned; if failed, RAPI_FALSE is returned.

Category

A/D converter

Reference

__CreateADC, __DestroyADC, __GetADC

Remark

- This API controls only ADST bit in the A/D control register (ADCR). Therefore, use this API only when the software converts (starts or stops) analog value to digital. When selecting trigger for A/D conversion, this API is not necessary.
- If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_ad_sh_7125.h"

void func( void )
{
   /* Disabling A/D converter for module 0 */
   __EnableADC( RAPI_AD_0 | RAPI_AD_OFF );
}
```

3) __DestroyADC

Synopsis

<Clearing of setting of A/D converter>

Boolean __DestroyADC(unsigned long data)

data	Setup data

Description

Clears setting of the specified A/D converter.

[data]

For data, set the following parameters. (Choose one from the following)

RAPI_AD_0	A/D module 0
RAPI_AD_1	A/D module 1

Return value

If A/D converter setting is successfully cleared, RAPI_TRUE is returned; if failed, RAPI_FALSE is returned.

Category

A/D converter

Reference

__CreateADC, __EnableADC, __GetADC

Remark

If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_ad_sh_7125.h"

void func( void )
{
   /* Clearing A/D converter for module 0 */
   __DestroyADC( RAPI_AD_0 );
}
```

4) __GetADC

Synopsis

<Acquisition of A/D conversion result>

Boolean __GetADC(unsigned long data1, unsigned short *data2)

data1	Setup data 1
data2	Pointer to the buffer in which A/D converted value is stored

Description

Acquires the A/D converted value from a specified A/D register.

[data1]

For data1, set the following parameters. To set multiple parameters at the same time, use the symbol "|" to separate each specified parameter.

RAPI_ADDR0	A/D data register 0
RAPI_ADDR1	A/D data register 1
RAPI_ADDR2	A/D data register 2
RAPI_ADDR3	A/D data register 3
RAPI_ADDR4	A/D data register 4
RAPI_ADDR5	A/D data register 5
RAPI_ADDR6	A/D data register 6
RAPI_ADDR7	A/D data register 7
RAPI_ADDR_ALL	All values in the A/D data registers 0 to 7

[data2]

For data2, specify a pointer to buffer in which the A/D converted value is stored.

Note: After A/D conversion, the converted value is right-aligned, while that is left-aligned in the A/D data register (ADDR).

Return value

If A/D converted value is successfully acquired, RAPI_TRUE is returned; if failed, RAPI_FALSE is returned.

Category

A/D converter

Reference

__CreateADC, __EnableADC, __DestroyADC

Remark

If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_ad_sh_7125.h"

void func( void )
{
    unsigned short data[2];

    /* Acquisition of an A/D convertered value
       in the A/D data register 0 */
    __GetADC( RAPI_ADDR0 | RAPI_ADDR1, &data );
}
```

5) __GetADCFlag

Synopsis

<Acquisition of A/D converter status>

Boolean __GetADCFlag(unsigned long data, unsigned char *status)

data	Setup data
status	Pointer to the buffer in which the register content indicating A/D converter status is stored

Description

Acquires the status flag of the specified A/D converter.

[data]

For data, set the following parameters. To acquire multiple status flags of A/D modules at the same time, use the symbol "|" to separate each specified parameter.

RAPI_AD_0	A/D module 0
RAPI_AD_1	A/D module 1

- A/D end flag (ADF) is the status flag which indicate the end of A/D conversion, and is corresponding to the bit 15 of the A/D control/status register (ADCSR).
- Configuration of ADCSR:

ADF	ADIE	0	0	TRGE	0	CONADF	STC	CKSL[1:0]	ADM[1:0]	ADCS	CH[2:0]

A/D end flag

Return value

If A/D converter status flag is successfully acquired, RAPI_TRUE is returned; if failed, RAPI_FALSE is returned.

Category

A/D converter

Reference

__ClearADCFlag

Remark

If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_ad_sh_7125.h"

void func( void )
{
    unsigned char status;

    /* Acquisition of status flag of A/D converter for module 0 */
    __GetADCStatus( RAPI_AD_0 | RAPI_AD_1, &status );
}
```

6) __ClearADCFlag

Synopsis

<Clearing of A/D converter status>

Boolean __ClearADCFlag(unsigned long data)

data	Setup data

Description

Clears the status flag of the specified A/D converter.

[data]

For data, set the following parameters. To clear multiple status flags of A/D modules at the same time, use the symbol "|" to separate each specified parameter.

RAPI_AD_0	A/D module 0
RAPI_AD_1	A/D module 1

- A/D end flag (ADF) is the status flag which indicate the end of A/D conversion, and is corresponding to the bit 15 of the A/D control/status register (ADCSR).
- Configuration of ADCSR:

ADF	ADIE	0	0	TRGE	0	CONADF	STC	CKSL[1:0]	ADM[1:0]	ADCS	CH[2:0]

A/D end flag

Return value

If A/D converter status flag is successfully cleared, RAPI_TRUE is returned; if failed, RAPI_FALSE is returned.

Category

A/D converter

Reference

__GetADCFlag

Remark

If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.

Program example

```
#include "rapi_ad_sh_7125.h"

void func( void )
{
   /* Clearing status flag of A/D converter */
   __ClearADCStatus( RAPI_AD_1 );
}
```

5. Usage Example

This chapter shows programming example to set each each driver in this library.

5.1. Serial Communication Inerface (SCI)

(1) SCI Reception

Figure 5.1 shows the setting of SCI channel 0 for clock asynchronous mode and the SCI reception of 5-byte data. A user needs to execute the processing after detecting reception error, if necessary.

```
#include "rapi_sif_sh_7125.h"

Boolean ErrorFlag;
unsigned char ReceiveBuf[5];
unsigned short ReceiveNum;
unsigned short SpeedValue = 25000000 / 32 / 38400 - 1;
               /* P-clock(Pϕ):25(MHz), Bit rate:38400(bit/s) */
unsigned short WaitTimerValue = 30000;

void INT_SCI0_RX( void );
void ErrorOpe( void );

/* Main routine */
void func( void )
{
    /* Setting SCI channel 0 for clock asynchronous mode */
    __CreateSCI( RAPI_COM1 | RAPI_SM_ASYNC | RAPI_CKDIR_INT |
                 RAPI_BCSS_P1 | RAPI_LSB_SEL | RAPI_8_BIT_LENGTH |
                 RAPI_STPB_1 | RAPI_PARITY_ODD | RAPI_MULTI_DIS |
                 RAPI_INT_RX_ERR_ENA | RAPI_SCI_INT_LV_2, SpeedValue );
    /* Setting receive-data size to 5 bytes and start-up SCI reception */
    __StartSCIReceiving( RAPI_COM1, ReceiveBuf, 5, &ReceiveNum );

    while( RAPI_TRUE ){
        if( ErrorFlag == RAPI_TRUE ){
            /* Detection of receive error and stop SCI reception
               after waiting for a definite period */
            __StopSCIReceiving( RAPI_COM1, WaitTimerValue );
            /* Error processing */
            ErrorOpe();
            break;
        }
        if( ReceiveNum == 5 ){
            /* End of 5-byte data reception */
            __StopSCIReceiving( RAPI_COM1, 0 );
            break;
        }
    }
}

/* Interrupt routine for SCI reception */
void INT_SCI0_RX( void )
{
    /* 5-byte data reception */
    if( __PollingSCIReceiving( RAPI_COM1 ) == RAPI_FALSE ){    /* Reception failure */
        ErrorFlag = RAPI_TRUE;
    }
}
```

Figure 5.1 SCI Reception Example

(2) SCI Transmission

Figure 5.2 shows the setting of SCI channel 0 for clock asynchronous mode and the SCI transmission of 5-byte data.

```
#include ”rapi_sif_sh_7125.h”

unsigned char  SendBuf[5];
unsigned short SendNum;
unsigned short SpeedValue = 25000000 / 32 / 38400 – 1;
               /* P-clock(Pϕ):25(MHz), Bit rate:38400(bit/s) */
unsigned short WaitTimerValue = 30000;

void INT_SCI0_TX( void );

/* Main routine */
void func( void )
{
   /* Setting SCI channel 0 for clock asynchronous mode */
   __CreateSCI( RAPI_COM1 | RAPI_SM_ASYNC | RAPI_CKDIR_INT |
                RAPI_BCSS_P1 | RAPI_LSB_SEL | RAPI_8_BIT_LENGTH |
                RAPI_STPB_1 | RAPI_PARITY_ODD | RAPI_MULTI_DIS |
                RAPI_INT_TX_ENA | RAPI_SCI_INT_LV_2, SpeedValue );
   /* Setting transmit-data size to 5 bytes and start-up SCI transmission */
   __StartSCISending( RAPI_COM1, SendBuf, 5, &SendNum );

   while( RAPI_TRUE ){
      if( SendNum == 5 ){
         /* End of 5-byte data transmission */
         __StopSCISending( RAPI_COM1, WaitTimerValue );
         break;
      }
   }
}

/* Interrupt routine for SCI transmission */
void INT_SCI0_TX( void )
{
   /* 5-byte data transmission */
   __PollingSCISending( RAPI_COM1 );
}
```

Figure 5.2 Example of SCI Transmission

5.2. Timer MTU2

(1) Timer mode

Figure 5.3 shows setting of MTU2 channel 0 for the timer mode. A user needs to execute processing by a callback function, if necessary.

```
#include "rapi_timer_sh_7125.h"

/* Declaration of callback function */
void TimerIntFunc( void );

void func( void )
{
    /* Setting MTU2 channel 0 for the timer mode */
    __CreateTimer( RAPI_MTU2_0 | RAPI_MP16 | RAPI_PERIODIC |
                   RAPI_RISING_EDGE | RAPI_TCNT_CLEAR_TGRB |
                   RAPI_OUTPUT_0_TOG | RAPI_COMPARE_MATCH_ENA |
                   RAPI_TIMER_INT_LV_5, 0x8000, TimerIntFunc );
    /* Start-up timer */
    __EnableTimer( RAPI_MTU2_0 | RAPI_TIMER_ON );
}
```

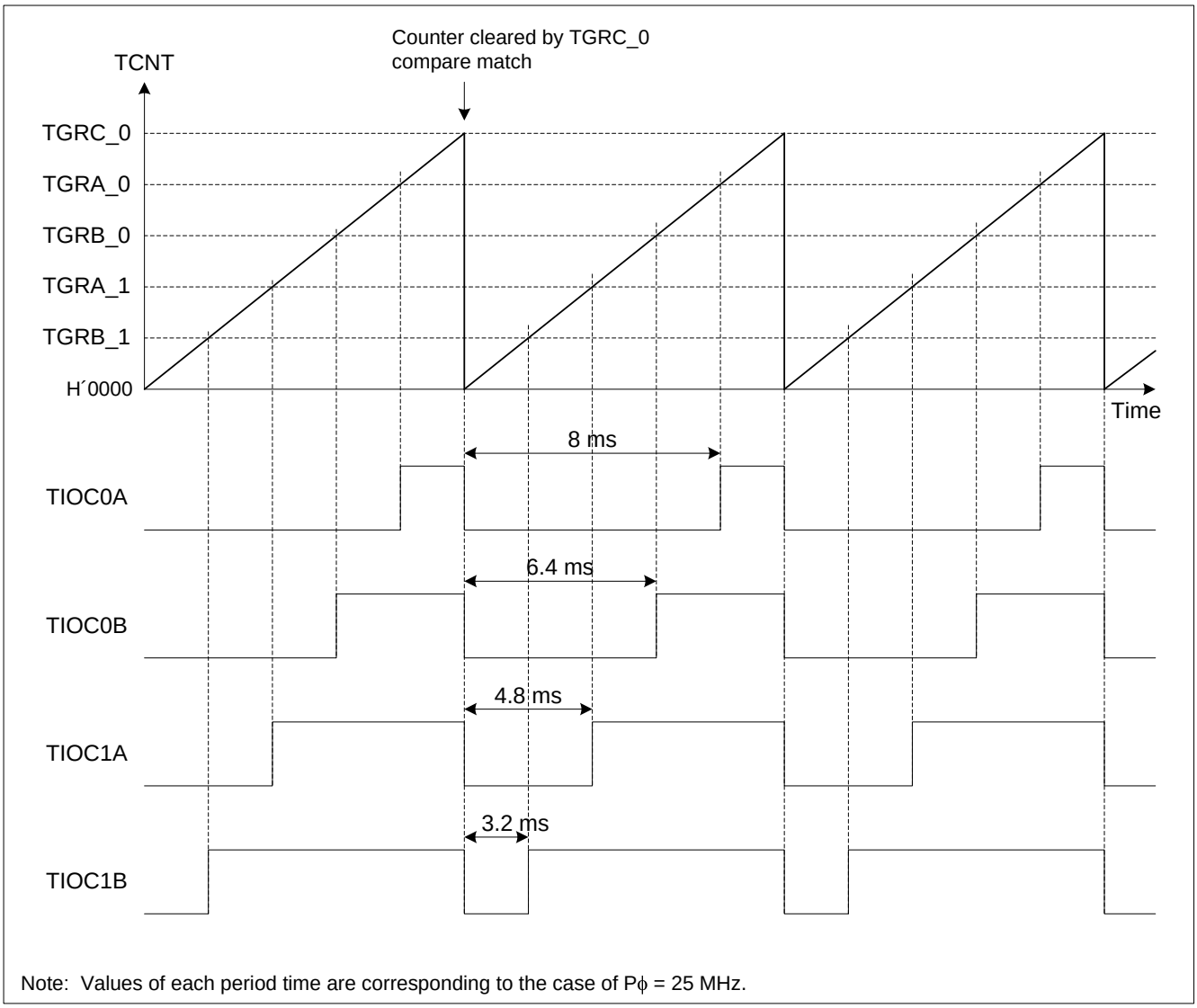
Figure 5.3 Example of Timer Mode

(2) PWM mode

Figure 5.4 shows setting of MTU2 channel 0 and 1 for the PWM mode 2. A user needs to execute processing by a callback function, if necessary. Figure 5.5 shows an example of behavior of setting by Figure 5.4 and PWM output waveform.

```
#include "rapi_timer_sh_7125.h"

unsigned short PeriodValue = 60000;  /* 0xEA60 */
unsigned short DutyValue1  = 50000;  /* 0xC350 */
unsigned short DutyValue2  = 40000;  /* 0x9C40 */
unsigned short DutyValue3  = 30000;  /* 0x7530 */
unsigned short DutyValue4  = 20000;  /* 0x4E20 */

/* Declaration of callback function */
void Timer0IntAFunc( void );
void Timer0IntBFunc( void );
void Timer0IntCFunc( void );
void Timer1IntAFunc( void );
void Timer1IntBFunc( void );

void func( void )
{
    /* Setting MTU2 channel 0 for PWM mode 2 */
    __CreatePWM( RAPI_MTU2_0 | RAPI_MP4 | RAPI_RISING_EDGE |
                 RAPI_PWM_MODE2 | RAPI_TCNT_CLEAR_TGRC |
                 RAPI_OVERFLOW_DIS | RAPI_TIMER_INT_LV_0 |
                 RAPI_TIMER_SYNC, RAPI_NULL );
    /* Setting TGRC_0 to the period register */
    __SetPWMPin( RAPI_MTU2_0 | RAPI_TGRC | RAPI_OUTPUT_RETAIN |
                 RAPI_COMPARE_MATCH_ENA | RAPI_TIMER_INT_LV_4,
                 PeriodValue, Timer0IntCFunc );
    /* Setting of TGRA_0 and TGRB_0 to the duty register */
    __SetPWMPin( RAPI_MTU2_0 | RAPI_TGRA | RAPI_OUTPUT_0_1 |
                 RAPI_COMPARE_MATCH_ENA | RAPI_TIMER_INT_LV_4,
                 DutyValue1, Timer0IntAFunc );
    __SetPWMPin( RAPI_MTU2_0 | RAPI_TGRB | RAPI_OUTPUT_0_1 |
                 RAPI_COMPARE_MATCH_ENA | RAPI_TIMER_INT_LV_4,
                 DutyValue2, Timer0IntBFunc );

    /* Setting MTU2 channel 1 for PWM mode 2 */
    __CreatePWM( RAPI_MTU2_1 | RAPI_MP4 | RAPI_RISING_EDGE |
                 RAPI_PWM_MODE2 | RAPI_TCNT_CLEAR_OTHER |
                 RAPI_OVERFLOW_DIS | RAPI_TIMER_INT_LV_0 |
                 RAPI_TIMER_SYNC, RAPI_NULL );
    /* Setting TGRA_1 and TGRB_1 to the duty register */
    __SetPWMPin( RAPI_MTU2_1 | RAPI_TGRA | RAPI_OUTPUT_0_1 |
                 RAPI_COMPARE_MATCH_ENA | RAPI_TIMER_INT_LV_4,
                 DutyValue3, Timer1IntAFunc );
    __SetPWMPin( RAPI_MTU2_1 | RAPI_TGRB | RAPI_OUTPUT_0_1 |
                 RAPI_COMPARE_MATCH_DIS | RAPI_TIMER_INT_LV_4,
                 DutyValue4, Timer1IntBFunc );

    /* Start-up timers */
    __EnablePWM( RAPI_MTU2_0 | RAPI_MTU2_1 | RAPI_TIMER_ON );
}
```

Figure 5.4 Example of PWM Mode 2



Note: Values of each period time are corresponding to the case of Pϕ = 25 MHz.

Figure 5.5 Example of Behavior of PWM Mode 2 and PWM Output Waveform

5.3. I/O Port

Figure 5.6 shows an example of I/O port read/write operation.

```
#include "rapi_io_port_sh_7125.h"

unsigned short data[2];

void func( void )
{
    /* Setting pin function of lower 8 bits on Port A as the port input */
    __SetIOPort( RAPI_FUNC_A | RAPI_LOWER_8_BITS |
                 RAPI_FUNC_IO | RAPI_PORT_INPUT );

    /* Reading bits 0 and 3 on Port A to data[0] and data[1], respectively */
    __ReadIOPort( RAPI_FUNC_A | RAPI_BIT_0 | RAPI_BIT_3 |
                  RAPI_BITS_OPE | RAPI_PORT_REGISTER, data );

    /* Setting pin function of bits 1 and 3 on Port B as the port output */
    __SetIOPort( RAPI_FUNC_B_L | RAPI_BIT_1 | RAPI_BIT_3 |
                 RAPI_FUNC_IO | RAPI_PORT_OUTPUT );

    /* Writing 'H' to bits 1 and 3 on Port B */
    __WriteIOPort( RAPI_FUNC_B_L | RAPI_BIT_1 | RAPI_BIT_3 |
                   RAPI_BITS_OPE, RAPI_H );
}
```

Figure 5.6 Example of I/O Port Read/Write Operation

5.4. External Interrupt

Figure 5.7 shows a usage example of external interrupt. A user needs to execute processing by a callback function, if necessary.

```
#include "rapi_interrupt_sh_7125.h"

/* Declaration of callback function */
void IntFunc( void );

void func( void )
{
   /* Setting IRQ0 interrupt:
      (Detection by rising edge; output disabling of detection signal
       for interrupt request; interrupt priority level 5) */
   __CreateInterrupt( RAPI_IRQ0 | RAPI_INT_RISING | RAPI_IRQOUT_HIGH_LEVEL |
                      RAPI_INT_LV_5, IntFunc );
   /* Enabling IRQ0 interrupt */
   __EnableInterrupt( RAPI_IRQ0 | RAPI_INT_REQUEST_CLEAR | RAPI_IRQ_ENA );
}
```

Figure 5.7 Example of External Interrupt

5.5. A/D Converter

Figure 5.8 shows a usage example of A/D converter. A user needs to execute processing by a callback function, if necessary.

```
#include "rapi_ad_sh_7125.h"

/* Declaration of callback function */
void AdIntFunc( void );

void func( void )
{
    /* Start-up A/D conversion by external trigger for AN2 pin */
    __CreateADC( RAPI_SINGLE | RAPI_AN2 | RAPI_P_2 | RAPI_50_STATES |
                 RAPI_TRIGGER_ENA | RAPI_EXTERNAL_TRIGGER_G0 |
                 RAPI_AD_INT_ENA | RAPI_ADC_INT_LV_3, AdIntFunc );
}
```

Figure 5.8 Example of A/D Conversion

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Rev.	Date	Description	
		Page	Summary
1.00	Aug. 8, 2008	-	First edition issued.
1.01	Aug. 27, 2008	4-89	Modification to fit the Japanese version of Rev.1.03.
		4-90	Same as above.
		4-102	Type of the second argument is amended.
		4-103	Type declaration for data is amended.
		4-115	Selectable parameters are added.
		5-6	Type declaration for data is amended.

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