

S1C17801

Clock Generator (CLG)

Application Note

When using the commands, follow the instructions of NOTICE_Application Notes Sample Programs.pdf being included in the downloaded compressed file.

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OVERVIEW

This document is a reference to use the clock generator function of S1C17801.

OPERATING ENVIRONMENT

- S5U1C17801T1100 (hereafter SVT17801:Software eValuation Tool for S1C17801)
SVT17801 CPU board and SVT17 ICD board
- USB miniB cable
- PC
GNU17 development tools pre-installed.
Installed with the USB driver for the SVT17 ICD board

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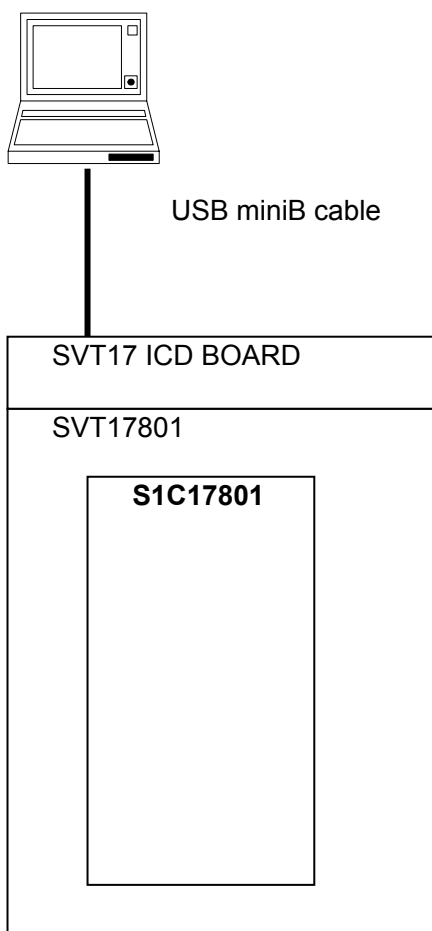
1. SPECIFICATIONS

This clock generator for S1C17801 consists of one channel of 16-bit timer and two channels of 8-bit timer. One channel of 16-bit timer can generate UART CH.0 clock, two channels of 8-bit timer can generate SPI CH.0 and I²C clock. The underflow signal is used to generate an interrupt and an internal serial interface clock. The timer setting enables the configuration of any interval and programmable serial transfer speed.

This application generates interrupts by starting the 16-bit timer for UART CH.0 and 8-bit timer of SPI CH.0 and I²C and displays the interrupts on the Simulated I/O.

The following describes the connection procedure.

PC(Installed with GNU17 development tools)



2. DESCRIPTIONS OF FUNCTIONS USED

2. DESCRIPTIONS OF FUNCTIONS USED

Operation clock Timer on the clock generator uses a prescaler output clock as the count clock. The prescaler divides the PCLK clock by 1/1 to 1/16384 to generate 15 clocks. This sample software sets up the clock to PCLK 1/4096.

Interrupt The timer interrupt vector number and the vector address of the clock generator are as follows:

16-bit Timer

Vector number: 12(0x0c)
Vector address: 0x900030

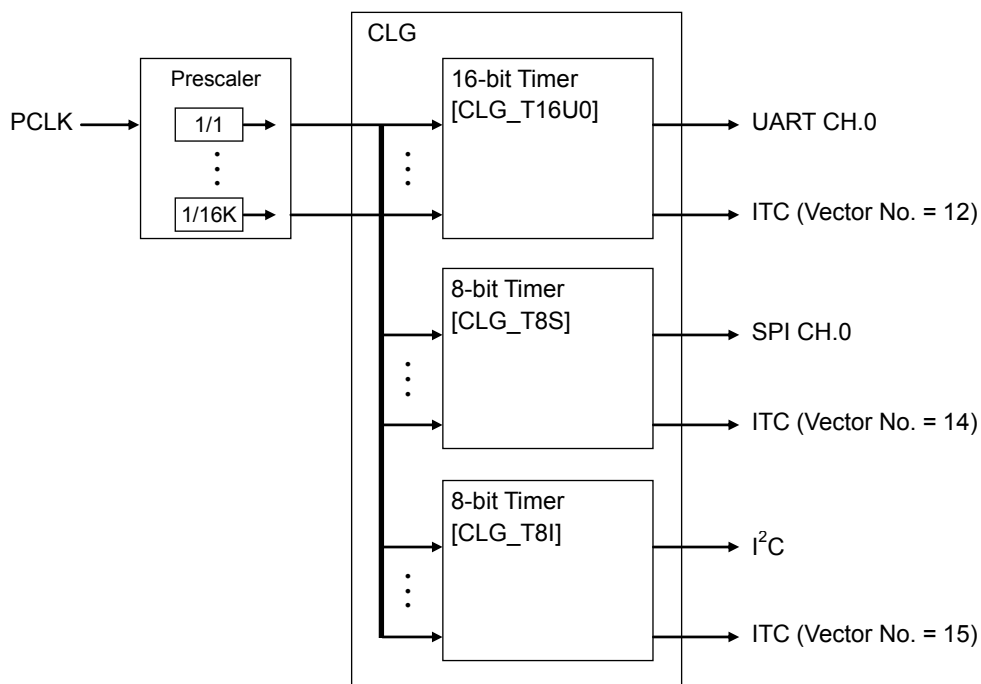
8-bit timer 1

Vector number: 14(0x0ce)
Vector address: 0x900038

8-bit timer 2

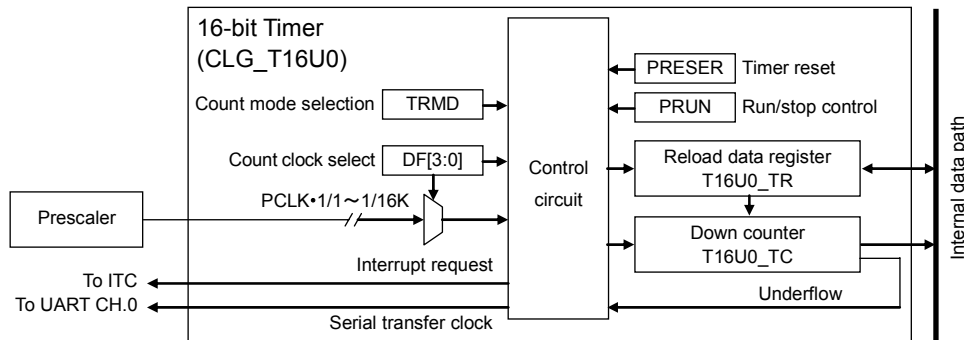
Vector number: 15(0x0f)
Vector address: 0x90003c

Whole CLG block

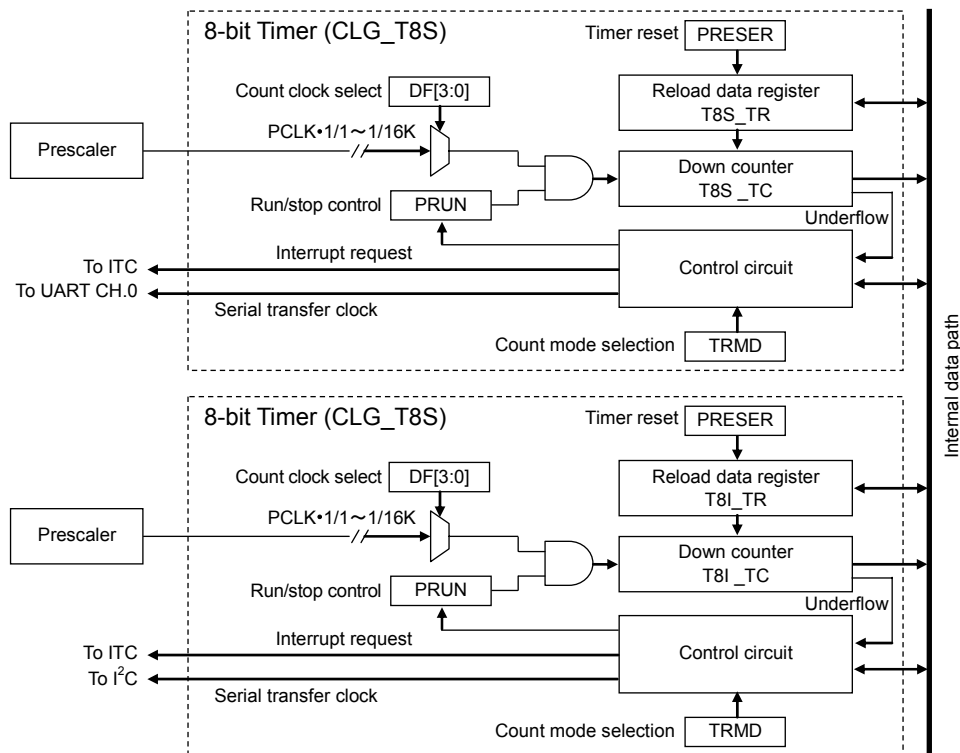


2. DESCRIPTIONS OF FUNCTIONS USED

CLG16-bit timer block



CLG 8-bit timer block



3. SOFTWARE DESCRIPTION

3. SOFTWARE DESCRIPTION

3.1 File Configuration

File name	Function
boot.c	Startup module
main.c	Main function
inthdlr.c	Interrupt handler function
vector.c	Vector table settings
header¥reg_801.h	Register definitions
header¥vector.h	Vector table definitions
clg_drv¥clg_drv.c	CLG driver API group
clg_drv¥clg_api.h	CLG driver API definitions
clg_gnu17IDE.lids	Linker script file
clg_gnu17IDE.cmd	GDB command file
clg_gnu17IDE.par	Parameter configuration file
clg_gnu17IDE.mak	Make file
.cdtproject	Project file
.gnu17project	Project file
.project	Project file
GDB17 Launch for clg.launch	Project startup file

3.2 Descriptions of the Modules

File name: main.c

Function name	Function
Main	Sets up the CLG timer and operations of each timer.
ExeClgforUART	Starts the 16-bit timer for UART and displays the relevant messages in the [Simulated I/O] window.
ExeClgforSPI	Starts the 8-bit timer for SPI and displays the relevant messages in the [Simulated I/O] window.
ExeClgforI2C	Starts the 8-bit timer for I ² C and displays the relevant messages in the [Simulated I/O] window.
PortInitialize	Initializes port
ItcInitialize	Initializes interrupt handler.
CpuIntEnable	Enables CPU interrupt
CpuIntDisable	Disables CPU interrupt
PrescalerOn	Starts prescaler

3.3 Global Variables

The following lists the global variables used in the sample program.

Variable name	Type	Function
g_ClgUartCnt	unsigned short	Used for storing UART 16-bit timer interrupt occurrence
g_ClgSpiCnt	unsigned short	Used for storing SPI 8-bit timer interrupt occurrence
g_ClgI2cCnt	unsigned short	Used for storing I ² C 8-bit timer interrupt occurrence

3.4 Structure

The following describes the structure used in the sample program.

Definition name		
T_CLG_CFG config		
Member		
countMode	unsigned char	Sets counter mode (0: Repeat mode, 1: One-shot mode)
inputClockSel	unsigned char	Sets the prescaler output clock
reloadData	unsigned short	Sets reload data
Remarks		
Structure for setting the initial value of CLG.		

3. SOFTWARE DESCRIPTION

3.5 Operating Procedures

Import the project

- (1) Launch the IDE and import the “clg” project.
 - ※For the import procedure, refer to S5U1C17001C Manual “3. Software Development Procedure.”
 - ※ Copy required drivers from the driver folder.

Build

- (1) Build “clg” project using the IDE.

Connection and powering on procedures

- (1) Connect SVT17801, USB miniB cable and PC.
- (2) Reset SVT17 ICD board.

Run the program.

- (1) Execute “clg” project using the IDE.

3.6 Outline of the sample program operations

The sample program causes the CLG timer interrupt to occur 10 times.

Stops the CLG timer as the 10th interrupt occurred.

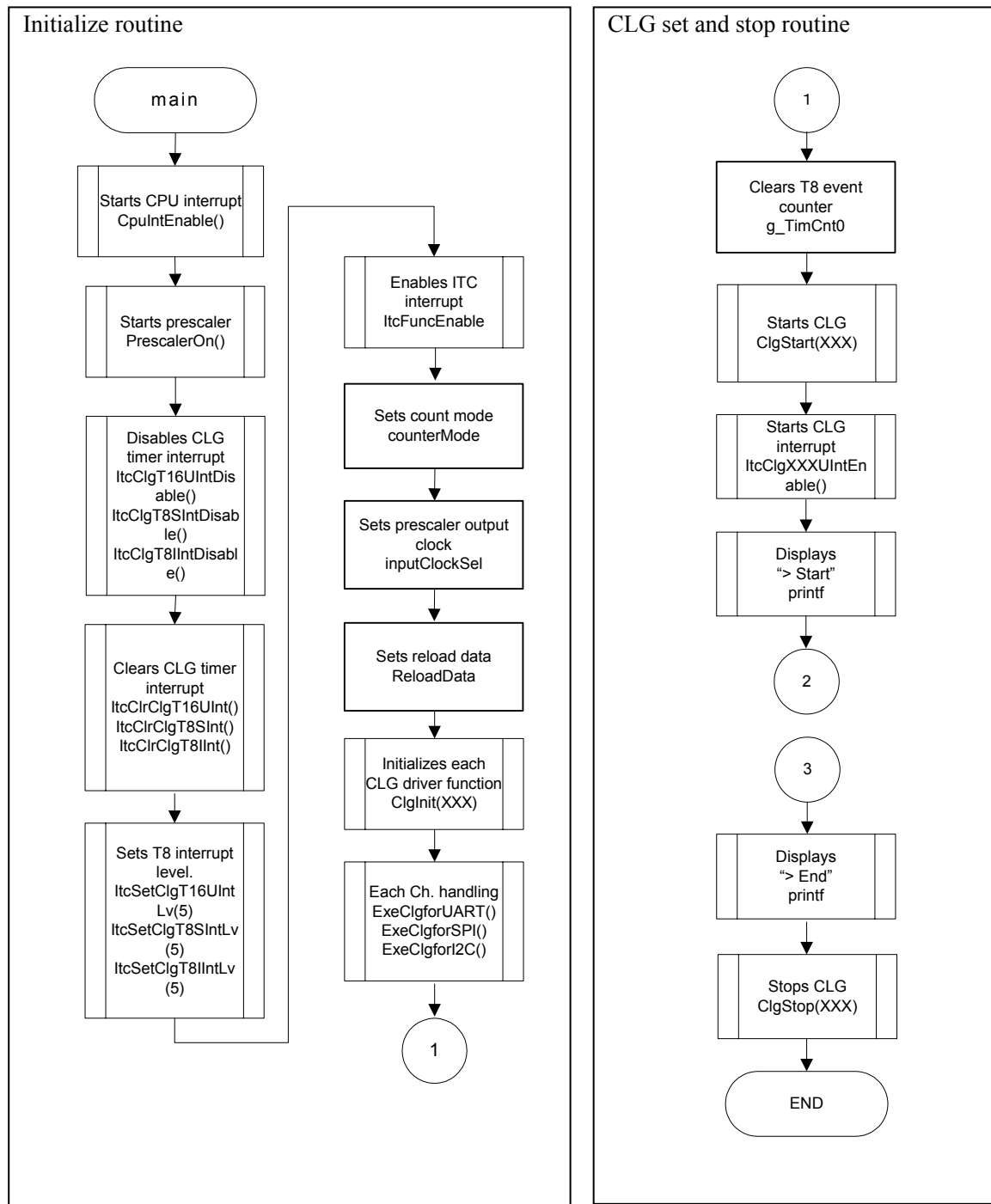
Displays the number of the interrupt occurrence in [Simulated I/O], each time it occurs, as follows:

“CLG(XXX) Interrupt ! : n times”

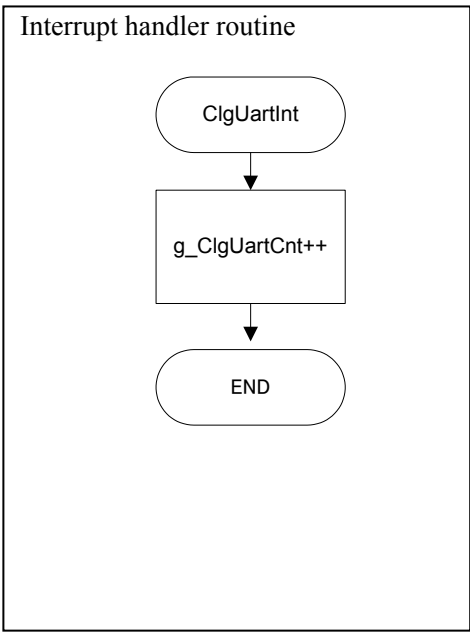
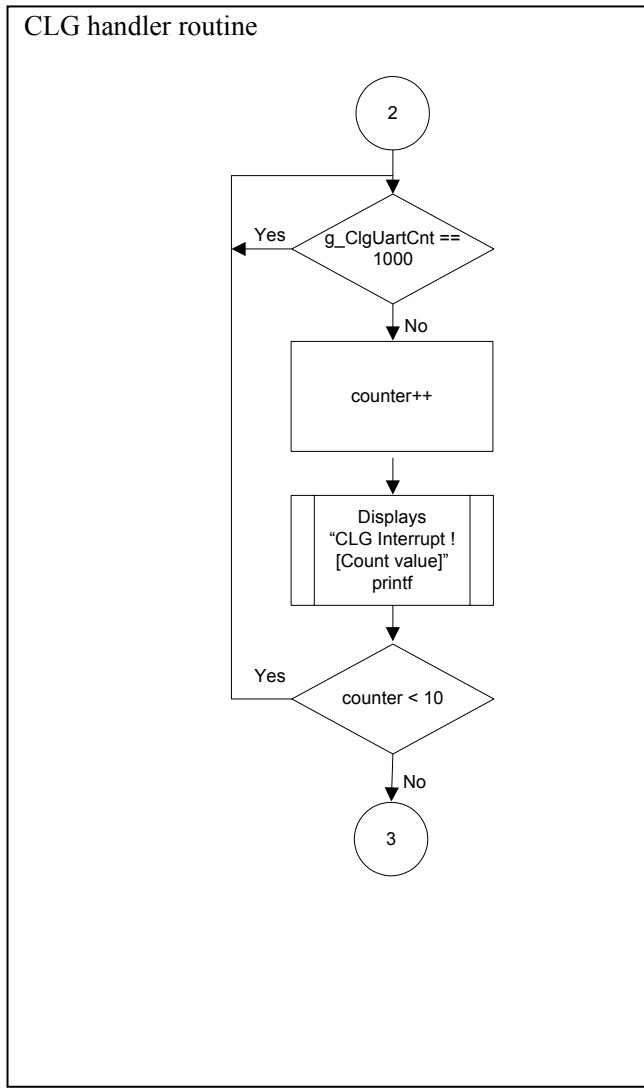
These steps are repeated for three timers. Either “XXX:UART”, “XXX:SPI”, or “XXX:I²C” is displayed.

3.7 Flowchart

The following shows the flowchart of the main routine and interrupt handler functions.



3. SOFTWARE DESCRIPTION



Describes only for CLG_UART,
but the same process for CLG_SPI and
CLG_I²C.

3.8 Detailed Explanation of the CLG Driver

The following explains the functions described in the files `clg_drv.c` and `clg_api.h`.

Initializing CLG

Format	void ClgInit(unsigned char usage, T_CLG_CFG* pConfig)
Function	Initializes CLG driver
Argument	usage - in Specifies timer to use *pConfig - in CLG initialization information
Return value	None
(Description) Executes the following process according to the usage number. (1) Sets counter mode (0: Repeat mode, 1: One-shot mode). (2) Sets the prescaler output clock (3) Sets reload data.	

Starting CLG

Format	void ClgStart(unsigned char usage)
Function	Starts the CLG timer.
Argument	Usage - in Specifies timer to use
Return value	None
(Description) Executes the following process according to the usage number. (1) Stops the count clock supplied to the counter. (2) Resets the timer. (3) Stops the timer.	

Stopping CLG

Format	void ClgStop(unsigned char usage)
Function	Stops the CLG timer.
Argument	usage - in Specifies timer to use
Return value	None
(Description) Executes the following process according to the usage number. (1) Stops the timer. (2) Stops the count clock supplied to the counter.	

3. SOFTWARE DESCRIPTION

CLG interruptfunction

Format	void ClgIntHdlr(unsigned char usage)
Function	CLG timer interrupt handler
Argument	Usage - in Specifies timer to use
Return value	None
(Description) Executes the CLG timer interrupt handler according to the usage number.	

Setting CLG T16U0 input clock [Macro function]

Format	Void ClgUart0_SetInputClkSel(unsigned short x)
Function	Selects the prescaler output clock.
Argument	X - in Specifies the clock
Return value	None
(Description) Sets an argument to Timer Input Clock Select of CLG_T16U0 Input Clock Select(CLG_T16U0_CLK) register.	

Obtaining CLG T16U0 input clock [Macro function]

Format	unsigned short ClgUart0_GetInputClkSel(void)
Function	Obtains the prescaler output clock setting.
Argument	None
Return value	Specifies the clock
(Description) Obtains the Timer Input Clock Select value of CLG_T16U0 Input Clock Select(CLG_T16U0_CLK) register.	

Setting CLG T16U0 reload data [Macro function]

Format	Void ClgUart0_SetReloadData(unsigned short x)
Function	Sets the reload data.
Argument	X - in Reload data value
Return value	None
(Description) Set an argument to CLG_T16U0 Reload Data(CLG_T16U0_TR) register.	

Obtaining CLG T16U0 reload data [Macro function]

Format	Unsigned short ClgUart0_GetReloadData (void)
Function	Obtains the reload data.
Argument	None
Return value	Reload data value
(Description) Obtains the data from CLG_T16U0 Reload Data(CLG_T16U0_TR) register.	

Obtaining CLG T16U0 count data [Macro function]

Format	Unsigned short ClgUart0_GetCounterData(void)
Function	Obtains the count data.
Argument	None
Return value	Count data value
(Description) Obtains the data from CLG_T16U0 Counter Data(CLG_T16U0_TC) register.	

Setting CLG T16U0 control register [Macro function]

Format	Void ClgUart0_SetControl(unsigned short x)
Function	Sets to the control register.
Argument	X - in Control register setting information
Return value	None
(Description) Set an argument to CLG_T16U0 Control(CLG_T16U0_CTL) register.	

Obtaining CLG T16U0 control register [Macro function]

Format	Unsigned short ClgUart0_GetControl(void)
Function	Obtains the control register setting information.
Argument	None
Return value	Control register setting information
(Description) Obtains the data from CLG_T16U0 Control(CLG_T16U0_CTL) register.	

Starting CLG T16U0 timer [Macro function]

Format	Void ClgUart0_TimerRun(void)
Function	Starts the timer operation.
Argument	None
Return value	None
(Description) Writes "1" to Timer Run/Stop Control of CLG_T16U0 Control(CLG_T16U0_CTL).	

Stopping CLG T16U0 timer [Macro function]

Format	Void ClgUart0_TimerStop(void)
Function	Stops the timer operation.
Argument	None
Return value	None
(Description) Writes "0" to Timer Run/Stop Control of CLG_T16U0 Control(CLG_T16U0_CTL).	

3. SOFTWARE DESCRIPTION

Resetting CLG T16U0 timer [Macro function]

Format	Void ClgUart0_TimerReset(void)
Function	Stops the timer operation.
Argument	None
Return value	None
(Description) Writes "1" to Timer Reset of CLG_T16U0 Control(CLG_T16U0_CTL).	

Setting CLG T16U0 counter mode to one-shot [Macro function]

Format	Void ClgUart0_SetOneShot(void)
Function	Sets counter mode of the 16-bit timer to one-shot mode.
Argument	None
Return value	None
(Description) Writes "1" to Count Mode Select of CLG_T16U0 Control(CLG_T16U0_CTL).	

Setting CLG T16U0 counter mode to repeat [Macro function]

Format	Void ClgUart0_SetRepeat(void)
Function	Sets counter mode of the 16-bit timer to repeat mode.
Argument	None
Return value	None
(Description) Writes "0" to Count Mode Select of CLG_T16U0 Control(CLG_T16U0_CTL).	

Setting CLG T8S input clock [Macro function]

Format	Void ClgSpi_SetInputClkSel(unsigned short x)
Function	Selects the prescaler output clock.
Argument	X - in Specifies the clock
Return value	None
(Description) Sets an argument to Timer Input Clock Select of CLG_T8S Input Clock Select(CLG_T8S_CLK) register.	

Obtaining CLG T8S input clock [Macro function]

Format	unsigned short ClgSpi_GetInputClkSel(void)
Function	Obtains the prescaler output clock setting.
Argument	None
Return value	Specifies the clock
(Description) Obtains the Timer Input Clock Select value of CLG_T8S Input Clock Select(CLG_T8S_CLK) register.	

Setting CLG T8S reload data [Macro function]

Format	Void ClgSpi_SetReloadData(unsigned short x)
Function	Sets the reload data.
Argument	X - in Reload data value
Return value	None
(Description) Set an argument to CLG_T8S Reload Data(CLG_T8S_TR) register.	

Obtaining CLG T8S reload data [Macro function]

Format	Unsigned short ClgSpi_GetReloadData (void)
Function	Obtains the reload data.
Argument	None
Return value	Reload data value
(Description) Obtains the data from CLG_T8S Reload Data(CLG_T8S_TR) register.	

Obtaining CLG T8S reload data [Macro function]

Format	Unsigned short ClgSpi_GetCounterData (void)
Function	Obtains the count data.
Argument	None
Return value	Count data value
(Description) Obtains the data from CLG_T8S Counter Data(CLG_T8S_TC) register.	

Setting CLG T8S control register [Macro function]

Format	Void ClgSpi_SetControl(unsigned short x)
Function	Sets to the control register.
Argument	X - in Control register setting information
Return value	None
(Description) Set an argument to CLG_T8S Control(CLG_T8S_CTL) register.	

Obtaining CLG T8S control register [Macro function]

Format	Unsigned short ClgSpi_GetControl(void)
Function	Obtains the control register setting information.
Argument	None
Return value	Control register setting information
(Description) Obtains the data from CLG_T8S Control(CLG_T8S_CTL) register.	

3. SOFTWARE DESCRIPTION

Starting CLG T8S timer [Macro function]

Format	Void ClgSpi_TimerRun(void)
Function	Starts the timer operation.
Argument	None
Return value	None
(Description) Writes "1" to Timer Run/Stop Control of CLG_T8S Control(CLG_T8S_CTL).	

Stopping CLG T8S timer [Macro function]

Format	Void ClgSpi_TimerStop(void)
Function	Stops the timer operation.
Argument	None
Return value	None
(Description) Writes "0" to Timer Run/Stop Control of CLG_T8S Control(CLG_T8S_CTL).	

Resetting CLG T8S timer [Macro function]

Format	Void ClgSpi_TimerReset(void)
Function	Stops the timer operation.
Argument	None
Return value	None
(Description) Writes "1" to Timer Reset of CLG_T8S Control(CLG_T8S_CTL).	

Setting CLG T8S counter mode to one-shot [Macro function]

Format	Void ClgSpi_SetOneShot(void)
Function	Sets counter mode of the 16-bit timer to one-shot mode.
Argument	None
Return value	None
(Description) Writes "1" to Count Mode Select of CLG_T8S Control(CLG_T8S_CTL).	

Setting CLG T8S counter mode to repeat [Macro function]

Function	Void ClgSpi_SetRepeat(void)
Argument	Sets counter mode of the 16-bit timer to repeat mode.
Return value	None
Function	None
(Description) Writes "0" to Count Mode Select of CLG_T8S Control(CLG_T8S_CTL).	

Setting CLG T8I input clock [Macro function]

Format	Void Clgl2c_SetInputClkSel(unsigned short x)
Function	Selects the prescaler output clock.
Argument	X - in Specifies the clock
Return value	None
(Description) Sets an argument to Timer Input Clock Select of CLG_T8I Input Clock Select(CLG_T8I_CLK) register.	

Obtaining CLG T8I input clock [Macro function]

Format	unsigned short Clgl2c_GetInputClkSel(void)
Function	Obtains the prescaler output clock setting.
Argument	None
Return value	Specifies the clock
(Description) Obtains the Timer Input Clock Select value of CLG_T8I Input Clock Select(CLG_T8I_CLK) register.	

Setting CLG T8I reload data [Macro function]

Format	Void Clgl2c_SetReloadData(unsigned short x)
Function	Sets the reload data.
Argument	X - in Reload data value
Return value	None
(Description) Set an argument to CLG_T8I Reload Data(CLG_T8I_TR) register.	

Obtaining CLG T8I reload data [Macro function]

Format	Unsigned short Clgl2c_GetReloadData (void)
Function	Obtains the reload data.
Argument	None
Return value	Reload data value
(Description) Obtains the data from CLG_T8I Reload Data(CLG_T8I_TR) register.	

Obtaining CLG T8I count data [Macro function]

Format	Unsigned short Clgl2c_GetCounterData (void)
Function	Obtains the count data.
Argument	None
Return value	Count data value
(Description) Obtains the data from CLG_T8I Counter Data(CLG_T8I_TC) register.	

3. SOFTWARE DESCRIPTION

Setting CLG T8I control register [Macro function]

Format	Void Clgl2c_SetControl(unsigned short x)
Function	Sets to the control register.
Argument	X - in Control register setting information
Return value	None
(Description) Sets an argument to CLG_T8I Control(CLG_T8S_CTL) register.	

Obtaining CLG T8I control register [Macro function]

Format	Unsigned short Clgl2c_GetControl(void)
Function	Obtains the control register setting information.
Argument	None
Return value	Control register setting information
(Description) Obtains the data from CLG_T8I Control(CLG_T8I_CTL) register.	

Starting CLG T8I timer [Macro function]

Format	Void Clgl2c_TimerRun(void)
Function	Starts the timer operation.
Argument	None
Return value	None
(Description) Writes "1" to Timer Run/Stop Control of CLG_T8I Control(CLG_T8I_CTL).	

Starting CLG T8I timer [Macro function]

Format	Void Clgl2c_TimerStop(void)
Function	Stops the timer operation.
Argument	None
Return value	None
(Description) Writes "0" to Timer Run/Stop Control of CLG_T8I Control(CLG_T8I_CTL).	

Resetting CLG T8I timer [Macro function]

Format	Void Clgl2c_TimerReset(void)
Function	Stops the timer operation.
Argument	None
Return value	None
(Description) Writes "1" to Timer Reset of CLG_T8I Control(CLG_T8I_CTL).	

Setting CLG T8I counter mode to one-shot [Macro function]

Format	Void Clgl2c_SetOneShot(void)
Function	Sets counter mode of the 16-bit timer to one-shot mode.
Argument	None
Return value	None
(Description) Writes "1" to Count Mode Select of CLG_T8I Control(CLG_T8I_CTL).	

Setting CLG T8I counter mode to repeat [Macro function]

Format	Void Clgl2c_SetRepeat(void)
Function	Sets counter mode of the 16-bit timer to repeat mode.
Argument	None
Return value	None
(Description) Writes "0" to Count Mode Select of CLG_T8I Control(CLG_T8I_CTL).	

3. SOFTWARE DESCRIPTION

3.9 Header Definitions

The table below show the definitions used in the driver functions.

Definition name	Value	Description
CLG_FOR_UART0	0	16-bit timer for CLG UART
CLG_FOR_SPI	2	8-bit timer for CLG SPI CH.0
CLG_FOR_I2C	3	8-bit timer for CLG I ² C
CLG_COUNT_REPEAT	0	Counter mode: Repeat mode
CLG_COUNT_ONE_SHOT	1	Counter mode: One-shot mode
CLG_INPUT_PCLK_1	0x00	Prescaler output clock: PCLK 1/1
CLG_INPUT_PCLK_2	0x01	Prescaler output clock: PCLK 1/2
CLG_INPUT_PCLK_4	0x02	Prescaler output clock: PCLK 1/4
CLG_INPUT_PCLK_8	0x03	Prescaler output clock: PCLK 1/8
CLG_INPUT_PCLK_16	0x04	Prescaler output clock: PCLK 1/16
CLG_INPUT_PCLK_32	0x05	Prescaler output clock: PCLK 1/32
CLG_INPUT_PCLK_64	0x06	Prescaler output clock: PCLK 1/64
CLG_INPUT_PCLK_128	0x07	Prescaler output clock: PCLK 1/128
CLG_INPUT_PCLK_256	0x08	Prescaler output clock: PCLK 1/256
CLG_INPUT_PCLK_512	0x09	Prescaler output clock: PCLK 1/512
CLG_INPUT_PCLK_1024	0x0A	Prescaler output clock: PCLK 1/1024
CLG_INPUT_PCLK_2048	0x0B	Prescaler output clock: PCLK 1/2048
CLG_INPUT_PCLK_4096	0x0C	Prescaler output clock: PCLK 1/4096
CLG_INPUT_PCLK_8192	0x0C	Prescaler output clock: PCLK 1/8192
CLG_INPUT_PCLK_16384	0x0C	Prescaler output clock: PCLK 1/16384

REVISION HISTORY

[illegible]

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