

# Application Note

## CG\_RTC

Arm and Keil are registered trademarks of Arm Limited (or its subsidiaries) in the US and/or elsewhere.

All other company names, product names, and service names mentioned herein may be trademarks of their respective companies.

## Table of Contents

Table of Contents.....	2
1. Preface .....	3
2. Technical Term .....	3
3. Reference Document .....	3
4. Target Sample Program .....	4
5. Configuration Diagram .....	4
6. Sample Program : CG_RTC .....	5
6.1. Outlines of Operation .....	5
6.1.1. NORMAL Mode .....	5
6.1.2. Low power consumption Mode .....	5
6.2. Function to Use.....	5
6.3. Interrupt to Use .....	5
6.4. Configuration.....	6
6.5. Example of Terminal Emulator Output .....	6
7. CG Driver .....	7
8. Revision History .....	8
<b>RESTRICTIONS ON PRODUCT USE .....</b>	<b>9</b>

### 1. Preface

This application note describes sample software for the switches between NORMAL mode and low power consumption mode using clock control and operation mode functions.  
This document helps the user check operation of a product under development and develop its program.

### 2. Technical Term

Term/Abbreviation	Definition
CG	Clock control and Operation Mode
BSP	Board Support Package
RTC	Real Time Clock
Timer	T32A : 32-bit Timer Event Counter

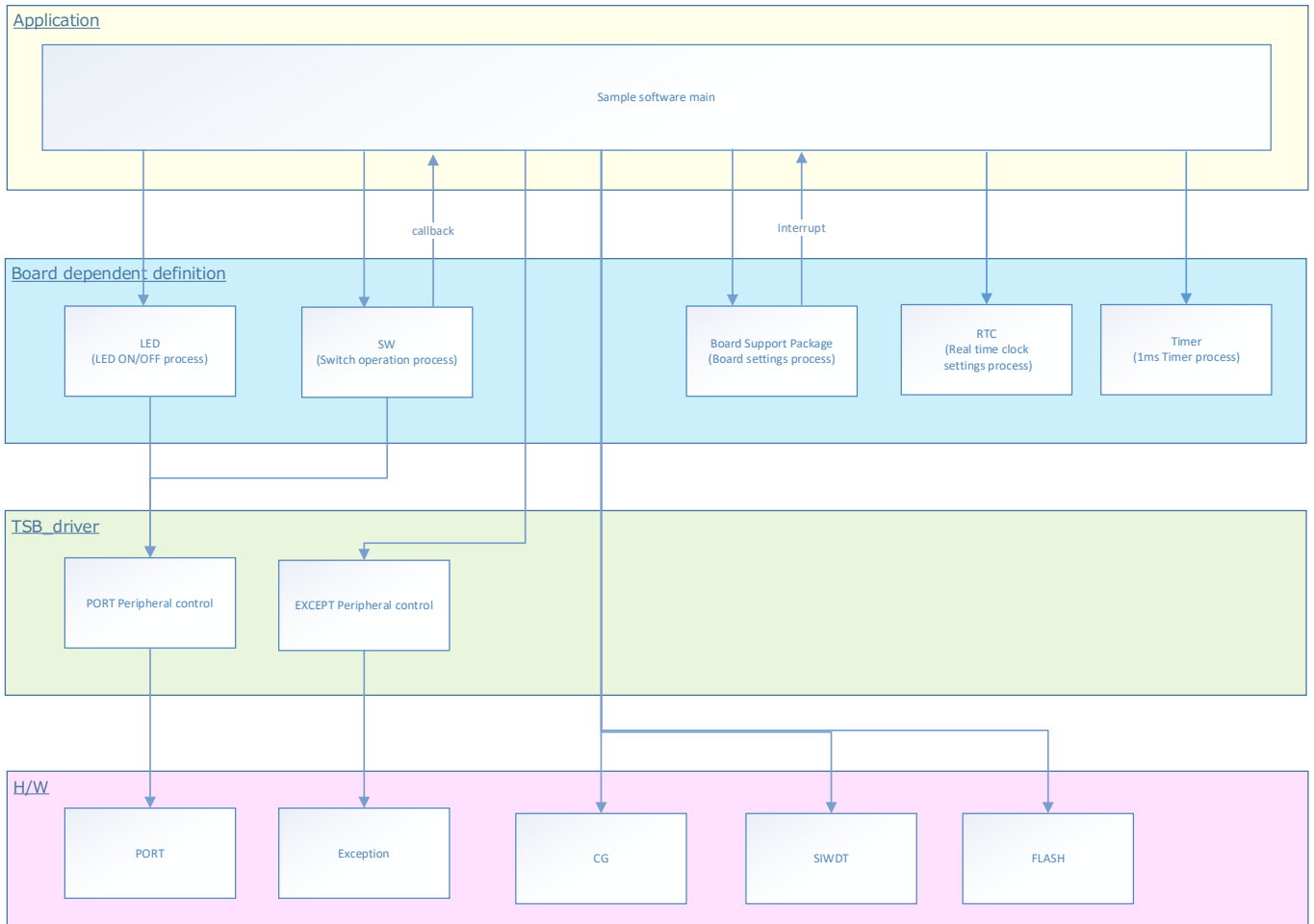
### 3. Reference Document

Document	Notes
Data sheet	Refer to the data sheet of MCU to be used.
Reference manual	Refer to the reference manual of each IP to be used.
Application note MCU User Guide	Refer to the MCU user guide to be used.

## 4. Target Sample Program

Sample Program	Outline
CG_RTC	Sample program of clock control and operation mode switching

## 5. Configuration Diagram



## 6. Sample Program : CG\_RTC

This is sample software that uses Push-Switch input and RTC as a trigger to switch the mode of the microcomputer.

### 6.1. Outlines of Operation

Switch to low power consumption mode (IDLE / STOP1 / STOP2) triggered by port input by Push-Switch. When shifting to the low power consumption mode, the LED lights up and you can check the operation switching.

After switching to the low power consumption mode, it will return to NORMAL mode after 1 minute by RTC.

#### 6.1.1. NORMAL Mode

In NORMAL mode, the following operations are performed.

- BSP\_LED\_1 blinks in Cycle\_A and Duty\_A (other LEDs are off).
- Port input monitoring (monitoring at intervals).
- Press BSP\_PSW\_1 to switch to IDLE mode.
- Press BSP\_PSW\_2 to switch to STOP1 mode.
- Press BSP\_PSW\_3 to switch to STOP2 mode.

#### 6.1.2. Low power consumption Mode

In the low power consumption mode, the following operations are performed.

##### IDLE

- BSP\_LED\_2 is on (other LEDs are off).
- After 1 minute by RTC, it shifts to NORMAL mode.

##### STOP1

- BSP\_LED\_3 is on (other LEDs are off).
- After 1 minute by RTC, it shifts to NORMAL mode.

##### STOP2

- BSP\_LED\_4 is on (other LEDs are off).
- After 1 minute by RTC, it shifts to NORMAL mode.

## 6.2. Function to Use

The functions to use are as follows.

For the Port assignment of each channel, refer to the MCU user guide.

IP	Channel	Objective
PORT	BSP_PSW_1	For event triggers
	BSP_PSW_2	For event triggers
	BSP_PSW_3	For event triggers
	BSP_LED_1	For operation check
	BSP_LED_2	For operation check
	BSP_LED_3	For operation check
	BSP_LED_4	For operation check
RTC	—	RTC for event triggers
T32A	BSP_T32A_TIMER_1	Used as a 1ms interval timer

## 6.3. Interrupt to Use

Interrupt	Outlines
INTRTC	RTC interrupt. For returning from IDLE / STOP1 / STOP2
INTT32A00A	T32A Timer A Timer counter increments every 1ms for Switch / LED processing

### 6.4. Configuration

“main.c” configuration setting.

Configuration	Current Value	Description
Cycle_A	2Hz	-
Duty_A	50%	-
Timer_A	1m	-

### 6.5. Example of Terminal Emulator Output

Nothing.

### 7. CG Driver

The CG is controlled by using the following driver.  
For an example of use, refer to the source code.

Driver	Control Outlines
cg_set_gear	Set the gear according to the register value
cg_set_phyt0	Set the pre-scaler clock according to the register value
cg_set_warm_up_time	Set warm-up time
cg_start_warmup	Start operation of warm-up timer for oscillator
cg_get_warm_up_state	Check if the warm-up is complete
cg_wait_warmup	Wait for the warm-up end of high-speed oscillation
cg_set_ehoscen	Select an external high speed oscillator
cg_set_oscsel	Set FOSC base clock
cg_get_oscsel	Check if it is in oscsel state
cg_get_gear	Update gear according to register value
cg_get_phyt0	Update prescaler clock according to register value
cg_ihosc1_enable	Enable internal high speed oscillator 1
cg_ihosc1_disable	Disable internal high speed oscillator 1
cg_set_PLL	Set the PLL according to the register value
cg_PLL_enable	Enable PLL
cg_PLL_disable	Disable PLL
cg_set_stby_mode	Set STBYmode according to register value
cg_set_PLL_clock	Set PLL base clock
cg_get_PLL_status	Check if it is in PLL0SEL state
cg_protect_enable	Enable CG protection
cg_protect_disable	Disable CG protection
cg_get_ihosc1_state	Check if it is in ihosc1 state
cg_get_ihosc2_state	Check if it is in ihosc2 state
cg_ihosc2_enable	Enable internal high speed oscillator 2
cg_ihosc2_disable	Disable internal high speed oscillator 2
cg_scout_enable	Enable SCOUT
cg_scout_disable	Disable SCOUT
cg_set_scout_clock	Set SCOUT base clock
cg_set_scout_time	Set SCOUT time
cg_get_stby_mode	Get TRBY mode register value
cg_set_low_warm_up_time	Set low oscillator warm-up time
cg_start_low_warmup	Start operation of warm-up timer for low oscillator
cg_get_low_warm_up_state	Check if low oscillator warm-up is complete
cg_get_system_core_clock	Get CG system core clock
rlm_port_keep_enable	Enable RLM port
rlm_port_keep_disable	Disable RLM port
rlm_protect_enable	Enable RLM protection
rlm_protect_disable	Disable RLM protection
rlm_fs_enable	Enable fs
rlm_fs_disable	Disable fs

## 8. Revision History

Revision	Date	Description
1.0	2023-06-28	First release



## RESTRICTIONS ON PRODUCT USE

Toshiba Corporation and its subsidiaries and affiliates are collectively referred to as "TOSHIBA". Hardware, software and systems described in this document are collectively referred to as "Product".

- TOSHIBA reserves the right to make changes to the information in this document and related Product without notice.
- This document and any information herein may not be reproduced without prior written permission from TOSHIBA. Even with TOSHIBA's written permission, reproduction is permissible only if reproduction is without alteration/omission.
- Though TOSHIBA works continually to improve Product's quality and reliability, Product can malfunction or fail. Customers are responsible for complying with safety standards and for providing adequate designs and safeguards for their hardware, software and systems which minimize risk and avoid situations in which a malfunction or failure of Product could cause loss of human life, bodily injury or damage to property, including data loss or corruption. Before customers use the Product, create designs including the Product, or incorporate the Product into their own applications, customers must also refer to and comply with (a) the latest versions of all relevant TOSHIBA information, including without limitation, this document, the specifications, the data sheets and application notes for Product and the precautions and conditions set forth in the "TOSHIBA Semiconductor Reliability Handbook" and (b) the instructions for the application with which the Product will be used with or for. Customers are solely responsible for all aspects of their own product design or applications, including but not limited to (a) determining the appropriateness of the use of this Product in such design or applications; (b) evaluating and determining the applicability of any information contained in this document, or in charts, diagrams, programs, algorithms, sample application circuits, or any other referenced documents; and (c) validating all operating parameters for such designs and applications. **TOSHIBA ASSUMES NO LIABILITY FOR CUSTOMERS' PRODUCT DESIGN OR APPLICATIONS.**
- **PRODUCT IS NEITHER INTENDED NOR WARRANTED FOR USE IN EQUIPMENTS OR SYSTEMS THAT REQUIRE EXTRAORDINARILY HIGH LEVELS OF QUALITY AND/OR RELIABILITY, AND/OR A MALFUNCTION OR FAILURE OF WHICH MAY CAUSE LOSS OF HUMAN LIFE, BODILY INJURY, SERIOUS PROPERTY DAMAGE AND/OR SERIOUS PUBLIC IMPACT ("UNINTENDED USE").** Except for specific applications as expressly stated in this document, Unintended Use includes, without limitation, equipment used in nuclear facilities, equipment used in the aerospace industry, lifesaving and/or life supporting medical equipment, equipment used for automobiles, trains, ships and other transportation, traffic signaling equipment, equipment used to control combustions or explosions, safety devices, elevators and escalators, and devices related to power plant. **IF YOU USE PRODUCT FOR UNINTENDED USE, TOSHIBA ASSUMES NO LIABILITY FOR PRODUCT.** For details, please contact your TOSHIBA sales representative or contact us via our website.
- Do not disassemble, analyze, reverse-engineer, alter, modify, translate or copy Product, whether in whole or in part.
- Product shall not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable laws or regulations.
- The information contained herein is presented only as guidance for Product use. No responsibility is assumed by TOSHIBA for any infringement of patents or any other intellectual property rights of third parties that may result from the use of Product. No license to any intellectual property right is granted by this document, whether express or implied, by estoppel or otherwise.
- **ABSENT A WRITTEN SIGNED AGREEMENT, EXCEPT AS PROVIDED IN THE RELEVANT TERMS AND CONDITIONS OF SALE FOR PRODUCT, AND TO THE MAXIMUM EXTENT ALLOWABLE BY LAW, TOSHIBA (1) ASSUMES NO LIABILITY WHATSOEVER, INCLUDING WITHOUT LIMITATION, INDIRECT, CONSEQUENTIAL, SPECIAL, OR INCIDENTAL DAMAGES OR LOSS, INCLUDING WITHOUT LIMITATION, LOSS OF PROFITS, LOSS OF OPPORTUNITIES, BUSINESS INTERRUPTION AND LOSS OF DATA, AND (2) DISCLAIMS ANY AND ALL EXPRESS OR IMPLIED WARRANTIES AND CONDITIONS RELATED TO SALE, USE OF PRODUCT, OR INFORMATION, INCLUDING WARRANTIES OR CONDITIONS OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, ACCURACY OF INFORMATION, OR NONINFRINGEMENT.**
- Do not use or otherwise make available Product or related software or technology for any military purposes, including without limitation, for the design, development, use, stockpiling or manufacturing of nuclear, chemical, or biological weapons or missile technology products (mass destruction weapons). Product and related software and technology may be controlled under the applicable export laws and regulations including, without limitation, the Japanese Foreign Exchange and Foreign Trade Law and the U.S. Export Administration Regulations. Export and re-export of Product or related software or technology are strictly prohibited except in compliance with all applicable export laws and regulations.
- Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product. Please use Product in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive. **TOSHIBA ASSUMES NO LIABILITY FOR DAMAGES OR LOSSES OCCURRING AS A RESULT OF NONCOMPLIANCE WITH APPLICABLE LAWS AND REGULATIONS.**

---

Toshiba Electronic Devices & Storage Corporation

<https://toshiba.semicon-storage.com/>