



Technical Document

GSM PROTOCOL STACK

G23

ARM7 I/O DRIVER

APPLICATION PROGRAMMING INTERFACE

Document Number:	8415.064.99.003
Version:	0.4
Status:	Draft
Approval Authority:	
Creation Date:	1999-Nov-10
Last changed:	2015-Mar-08 by XINTE GRA
File Name:	Armio_api.doc

Important Notice

Texas Instruments Incorporated and/or its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products, software and services at any time and to discontinue any product, software or service without notice. Customers should obtain the latest relevant information during product design and before placing orders and should verify that such information is current and complete.

All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment. TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI products, software and/or services. To minimize the risks associated with customer products and applications, customers should provide adequate design, testing and operating safeguards.

Any access to and/or use of TI software described in this document is subject to Customers entering into formal license agreements and payment of associated license fees. TI software may solely be used and/or copied subject to and strictly in accordance with all the terms of such license agreements.

Customer acknowledges and agrees that TI products and/or software may be based on or implement industry recognized standards and that certain third parties may claim intellectual property rights therein. The supply of products and/or the licensing of software does not convey a license from TI to any third party intellectual property rights and TI expressly disclaims liability for infringement of third party intellectual property rights.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products, software or services are used.

Information published by TI regarding third-party products, software or services does not constitute a license from TI to use such products, software or services or a warranty, endorsement thereof or statement regarding their availability. Use of such information, products, software or services may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

No part of this document may be reproduced or transmitted in any form or by any means, electronically or mechanically, including photocopying and recording, for any purpose without the express written permission of TI.

Change History

Date	Changed by	Approved by	Version	Status	Notes
1999-Nov-10	TSE et al.		0.1		1
1999-Dec-07	TSE et al.		0.2		2
1999-Dec-13	TSE et al.		0.3		3
2003-May-20	XINTEGRA		0.4	Draft	

Notes:

1. Initial version
2. Corrections
3. Function parameters updated

Table of Contents

2.1	Data types	4
2.2	Constants	5
2.3	Functions	6
2.3.1	AIO_Init – Driver Initialization	7
2.3.2	AIO_Exit – Driver finalization	8
2.3.3	AIO_EnableBit - Enable ARMIO input/output bit	9
2.3.4	AIO_DisableBit – Disable ARMIO input/output bit	10
2.3.5	AIO_SetBit - Switch-on one bit	11
2.3.6	AIO_ResetBit - Switch-off one bit	12
2.3.7	AIO_ConfigBitAsOutput - Set this bit as an output	13
2.3.8	AIO_ConfigBitAsInput - Set this bit as an input	14
2.3.9	AIO_ReadBit - Read value in register	15
2.3.10	AIO_SetSimIO3V - Set SIM IO to 3 Volts	16
2.3.11	AIO_Power - Switch the board on or off	17
2.3.12	AIO_ResetTspIO - Reset all default TSP configurations	18
2.3.13	AIO_ResetDbgReg - Reset all default DBG configurations	19
2.3.14	AIO_ResetIoConfig - Reset all default IO configurations	20
A.	Acronyms	21
B.	Glossary	21

List of Figures and Tables

List of References

- [ISO 9000:2000] International Organization for Standardization. Quality management systems - Fundamentals and vocabulary. December 2000

1 Introduction

G23 is a software package implementing Layers 2 and 3 of the ETSI-defined GSM air interface signaling protocol, and as such represents the part of a GSM mobile station's protocol software which is both, platform and manufacturer independent. Therefore, G23 can be viewed as a building block providing standardized functionality through generic interfaces for easy integration.

The G23 suite of products consists of the following items:

- Layers 2 and 3 for speech & short message services,
- Layers 2 and 3 for fax & data services,
- Application Control Interface/AT Command Interface,
- MMI and MMI Framework (MFW) and
- Test and integration support tools.

This document describes the functional interface of the G23 ARM7 I/O driver. This driver is used to control the General Purpose I/O bits of the ARM7 core, that are used by the MMI. Addresses and masks for the ARM7 input/output bits are hardware-specific and must be redefined for each implementation.

2 Interface description of the ARM_IO driver

2.1 Data types

Name	Description
UBYTE	unsigned 8 bit integer data type
BYTE	signed 8 bit integer data type
USHORT	unsigned 16 bit integer data type
SHORT	signed 16 bit integer data type

2.2 Constants

Name	Description
CLKM_IO_CNTL	CLKM IO Pin select control register
CLKM_TSPACT_CNTL	CLKM TSPACT Pin select control register
ARMIO_OUT	GPIO output register
ARMIO_IN	GPIO input register
CLKM_DBG_CNTL1	CLKM DBG1 Pin select Control register
CLKM_DBG_CNTL2	CLKM DBG2 Pin select Control register
ARMIO_CNTL	I/O control register
ARMIO_DTR	DTR of UART bit in GPIO output register
ARMIO_DSR	DSR of UART bit in GPIO output register
ARMIO_IICclock	I ² C bus clock level control bit in GPIO output register
ARMIO_PowerOFF	Auto power off control bit in GPIO output register
ARMIO_HFdetect	HF detect bit in GPIO input register
ARMIO_LEDIndicate	LED indicate bit in GPIO output register
ARMIO_Vibrator	Vibrator On/Off control bit in GPIO output register
ARMIO_HSdetect	HS detect bit in GPIO input register
ARMIO_LEDbackLight	LCD backlight control bit in GPIO output register
ARMIO_EXTkey	Call Key indication bit in GPIO input register
ARMIO_LCDeClock	LCD device I ² C bus clock control bit in GPIO output register
ARMIO_RFeable	RF enable control bit in GPIO output register
ARMIO_IICdata	I ² C bus data control/detect bit in GPIO input or output register
ARMIO_LCDdata	LCD device I ² C bus data control/detect bit in GPIO input or output register
ARMIO_VEGAdown	VEGA power indication bit in GPIO input register
ARMIO_BOARD_POWER	Power on/off bit in GPIO output register
DRV_BUFFER_FULL	The internal buffer is exhausted
DRV_DISABLED	Driver is not enabled
DRV_ENABLED	Driver is enabled
DRV_NOTCONFIGURED	Driver is not configured
DRV_INITFAILURE	Driver initialization failed
DRV_INITIALIZED	Driver is already initialized
DRV_INTERNAL_ERROR	Unspecified internal driver error
DRV_INPROCESS	The requested function is currently being executed
DRV_INVALID_PARAMS	One or more parameters are out of range or invalid
DRV_NOTCONFIGURED	Driver is not configured
DRV_OK	Return value indicating the function completed successfully
DRV_UNKNOWN	Unknown device accessed
DRV_SIGFCT_NOTAVAILABLE	The requested event signaling functionality is not available

2.3 Functions

Name	Description
AIO_Init	Initialization of the driver
AIO_Exit	Termination of the driver
AIO_EnableBit	Enable ARMIO input/output bit
AIO_DisableBit	Disable ARMIO input/output bit
AIO_SetBit	Switch-on one bit
AIO_ResetBit	Switch-off one bit
AIO_ConfigBitAsOutput	Set this bit as an output
AIO_ConfigBitAsInput	Set this bit as an input
AIO_ReadBit	Read value in register
AIO_SetSimIO3V	Set SIM IO to 3 Volts
AIO_Power	Switch-on or off the board
AIO_ResetTspIO	Reset all default TSP configurations
AIO_ResetDbgReg	Reset all default DBG configurations
AIO_ResetIoConfig	Reset all default IO configurations

2.3.1 AIO_Init – Driver Initialization

Definition:

```
USHORT AIO_Init
(
    USHORT          DrvHandle
    T_DRV_CB_FUNC   in_SignalCBPtr
    T_DRV_EXPORT ** DrvInfo
);
```

Parameters:

Name	Description
DrvHandle	unique handle for this driver
in_SignalCBPtr	This parameter points to the function that is called at the time an event that is to be signaled occurs. This value can be set to NULL if event signaling should not be possible.
DrvInfo	pointer to the driver parameters (see GDI specification document for a description of T_DRV_EXPORT).

Return values:

Name	Description
DRV_OK	Initialization successful
DRV_INITIALIZED	Driver already initialized
DRV_INITFAILURE	Initialization failed

Description

This function needs to be implemented in all drivers.

The function initializes the driver's internal data. The function returns DRV_OK in the case of a successful completion.

The function returns DRV_INITIALIZED if the driver has already been initialized and is ready to be used or is already in use. In the case of an initialization failure, which means that the driver cannot be used, the function returns DRV_INITFAILURE.

The driver exports its properties such as name, the functions to access driver functionality and a bitfield called flags by the parameter DrvInfo. If the driver is called by ISR, Bit(0) in the bitfield is set, otherwise this bit is cleared.

The driver stores the DrvHandle and passes it via the SignalID to the calling process each time the callback function is called.

2.3.2 AIO_Exit – Driver finalization

Definition:

```
void AIO_Exit  
(  
    void  
);
```

Parameters:

Name	Description
-	-

Return values:

Name	Description
-	-

Description

This function needs to be implemented in all drivers.

The function is called when the driver functionality is no longer needed. The function “de-allocates” all allocated resources and finalizes the driver.

2.3.3 AIO_EnableBit - Enable ARMIO input/output bit

Definition:

```
void AIO_EnableBit(  
    int    bit);
```

Parameters:

Name	Description
bit	Bit to enable in CLKM IO Pin select control register

Return values:

Name	Description
-	

Description

This function is used to activate a single bit in the IO Pin select control register of the CLKM module . After the call of this function, the bit can be set/reset or read via AIO_SetBit(),AIO_ResetBit or AIO_ReadBit().

2.3.4 AIO_DisableBit – Disable ARMIO input/output bit

Definition:

```
void AIO_DisableBit(  
    int    bit);
```

Parameters:

Name	Description
bit	Bit to disable in CLKM IO Pin select control register

Return values:

Name	Description
-	

Description

This function is used to deactivate a single bit in the IO Pin select control register of the CLKM module . After the call of this function, the bit could no longer be controlled or read by the driver.

2.3.5 AIO_SetBit - Switch-on one bit

Definition:

```
void AIO_SetBit(  
    int    bit);
```

Parameters:

Name	Description
bit	Bit to set in GPIO output register

Return values:

Name	Description
-	

Description

This function is used to set a single bit in the GPIO output register of the ARM7 core. All other bits in this register will not be affected.

2.3.6 AIO_ResetBit - Switch-off one bit

Definition:

```
void AIO_ResetBit(  
    int    bit);
```

Parameters:

Name	Description
bit	Bit to clear in GPIO output register

Return values:

Name	Description
-	

Description

This function is used to clear a single bit in the GPIO output register of the ARM7 core. All other bits in this register will not be affected.

2.3.7 AIO_ConfigBitAsOutput - Set this bit as an output

Definition:

```
void AIO_ConfigBitAsOutput(  
    int    bit);
```

Parameters:

Name	Description
bit	Bit to configure in I/O control register

Return values:

Name	Description
-	

Description

This function is used to control a single bit in the GPIO output register of the ARM7 core. All other bits in this register will not be affected. After the call of `AIO_ConfigBitAsOutput()`, the bit must be activated via `AIO_EnableBit()` to control it.

2.3.8 AIO_ConfigBitAsInput - Set this bit as an input

Definition:

```
void AIO_ConfigBitAsInput(  
    int    bit);
```

Parameters:

Name	Description
bit	Bit to configure in I/O control register

Return values:

Name	Description
-	

Description

This function is used to sense a single bit in the GPIO input register of the ARM7 core. All other bits in this register will not be affected. After the call of `AIO_ConfigBitAsInput()`, the bit must be activated via `AIO_EnableBit()` to be able to read it.

2.3.9 AIO_ReadBit - Read value in register

Definition:

```
USHORT AIO_ReadBit(  
    int    bit);
```

Parameters:

Name	Description
bit	Bit to read in GPIO input register

Return values:

Name	Description
0	Bit was not set
1	Bit was set

Description

This function is used to read a single bit in the GPIO input register of the ARM7 core. All other bits in this register will not be affected. The function returns the value of the bit.

2.3.10 AIO_SetSimIO3V - Set SIM IO to 3 Volts

Definition:

```
void AIO_SetSimIO3V(  
    USHORT          StdOutput)
```

Parameters:

Name	Description
StdOutput	0 for Open Drain (5V operation) 1 for Standard Output (3V operation)

Return values:

Name	Description
-	

Description

This function is used to set the SIM IO voltage in the CLKM TSPACT Pin select control register . This function is currently needed only for the A Sample.

2.3.11 AIO_Power - Switch the board on or off

Definition:

```
void AIO_Power(  
    USHORT    power);
```

Parameters:

Name	Description
power	0 to power-on (maintain power) 1 to power-off

Return values:

Name	Description
-	

Description

This function is used to switch the board on or off via the ARMIO_BOARD_POWER bit in the GPIO output register of the ARM7 core. Be sure that the ARMIO_BOARD_POWER bit is configured as output and activated.

2.3.12 AIO_ResetTspIO - Reset all default TSP configurations

Definition:

```
void AIO_ResetTspIO(void)
```

Parameters:

Name	Description
-	

Return values:

Name	Description
-	

Description

This function is used to clear all bits in the CLKM TSPACT Pin select control register.

2.3.13 AIO_ResetDbgReg - Reset all default DBG configurations

Definition:

```
void AIO_ResetDbgReg(void);
```

Parameters:

Name	Description
-	

Return values:

Name	Description
-	

Description

This function is used to clear all bits in the CLKM DBG1 and DBG2 Pin select Control register.

2.3.14 AIO_ResetIoConfig - Reset all default IO configurations

Definition:

```
void AIO_ResetIoConfig( void);
```

Parameters:

Name	Description
-	

Return values:

Name	Description
-	

Description

This function is used to clear all bits in the I/O control and CLKM

Appendices

A. Acronyms

DS-WCDMA Direct Sequence/Spread Wideband Code Division Multiple Access

B. Glossary

International Mobile Telecommunication 2000 (IMT-2000/ITU-2000) Formerly referred to as FPLMTS (Future Public Land-Mobile Telephone System), this is the ITU's specification/family of standards for 3G. This initiative provides a global infrastructure through both satellite and terrestrial systems, for fixed and mobile phone users. The family of standards is a framework comprising a mix/blend of systems providing global roaming. <URL: <http://www.imt-2000.org/>>