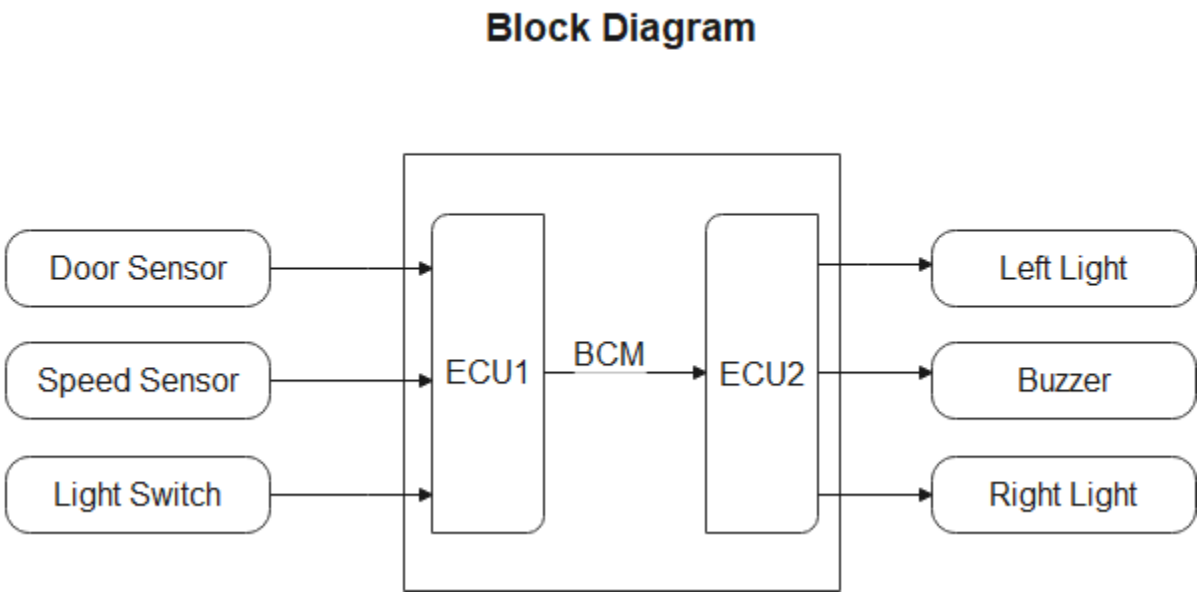
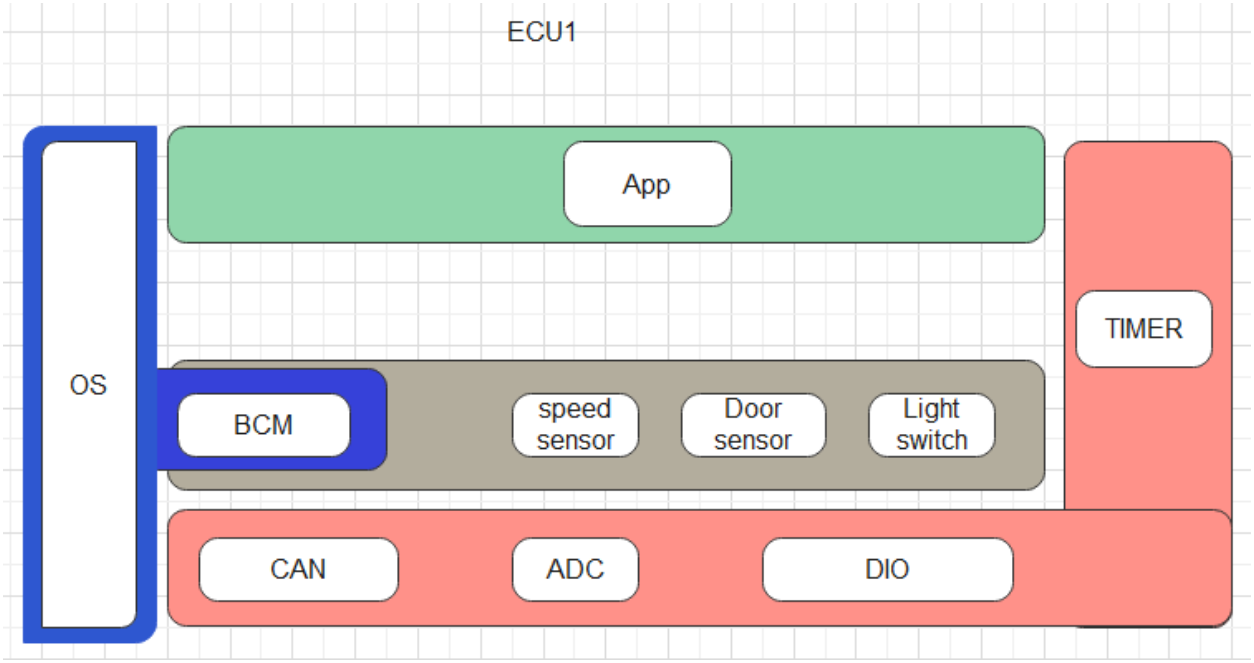
System Block diagram



Layered architecture



ECU Components and Modules

1. OS
    - OS_Init
    - OS_Update
2. Time
    - TIM_Init
    - TIM_GetTime
    - TIM_GetMod
3. Switch
    - LSW_Init
    - LSW_Update
    - LSW_GetState
4. Door sensor
    - DSens_Init
    - DSens_GetState
5. Speed sensor
    - SpSens_Init
    - SpSens_GetSpeed
6. BCM
    - BCM_Init
    - BCM_GetData
    - BCM_SetData

Modules for ECU1

Typedefs

TIM_ValueType

Name	TIM_ValueType
Type	uint
Range	The range of this type is µC dependent (width of the timer register) and has to be described by the supplier.
Description:	Type for reading and setting the timer values (in number of ticks).

TIM_ModeType

Name	TIM_ModeType
Type	Enum
Range	TIM_MOD_NORMAL: Normal operation mode of the Timer TIM_MOD_SLEEP: Operation for reduced power operation mode. In sleep mode only wakeup capable channels are available.
Description:	Select different power mode

TIM_ChannelType

Name	TIM_ChannelType
Type	uint
Range	The range of this type is µC and application dependent
Description:	Numeric ID for channel timer

Dio_LevelType

Name	Dio_LevelType
Type	uint8
Range	STD_LOW 0V STD_HIGH 5V or 3.3V
Description:	These are the possible levels a DIO channel can have (input or output)

Dio_PortType

Name	Dio_PortType
Type	uint8
Range	Shall cover all available DIO Ports.
Description:	Numeric ID of a DIO port.

Dio_ChannelType

Name	Dio_ChannelType
Type	uint
Range	Shall cover all available DIO channels
Description:	Numeric ID of a DIO channel.

Can_HwHandleType

Name	Can_HwHandleType
Type	uint8, uint16
Range	Shall cover all available DIO channels
Description:	Numeric ID of a DIO channel.

MCAL Layer API's

1- Timer

TIM_Init

Name	TIM_Init
Syntax	void TIM_Init(const Gpt_ConfigType* ConfigPtr)
Sync/Async:	Synchronous
Reentrancy	Non Reentrant
Parameters(in):	ConfigPtr : pointer to configuration set
Parameters(out):	None
Return value:	None
Description:	Initializes the hardware timer module.

TIM_GetTime

Name	TIM_GetTime
Syntax	TIM_ValueType TIM_GetTime (TIM_ChannelType Channel)
Sync/Async:	Synchronous
Reentrancy	Reentrant
Parameters(in):	Channel : Numeric id for timer channel
Parameters(out):	None
Return value:	TIM_ValueType : Elapsed timer value (in number of ticks)
Description:	Returns the time already elapsed.

TIM_GetMod

Name	TIM_GetMod
Syntax	TIM_ModeType TIM_GetMod (TIM_ChannelType Channel)
Sync/Async:	Synchronous
Reentrancy	Reentrant
Parameters(in):	Channel : Numeric id for timer channel
Parameters(out):	None
Return value:	TIM_ModeType : mode of timer channel
Description:	Returns the timer mode

2- DIO

Dio_ReadChannel

Name	Dio_ReadChannel
Syntax	Dio_LevelType Dio_ReadChannel(Dio_ChannelType ChannelId)
Sync/Async:	Synchronous
Reentrancy	Reentrant
Parameters(in):	ChannelId
Parameters(out):	None
Return value:	Dio_LevelType
Description:	Return the value of the specified channel

Dio_WriteChannel

Name	Dio_WriteChannel
Syntax	Dio_LevelType Dio_WriteChannel(Dio_ChannelType ChannelId, Dio_LevelType level)
Sync/Async:	Synchronous
Reentrancy	Reentrant
Parameters(in):	ChannelId
	level
Parameters(out):	None
Return value:	None
Description:	Set the level of a channel

3- ADC

Adc_Init

Name	ADC_Init
Syntax	void Adc_Init(const Adc_ConfigType* ConfigPtr)
Sync/Async:	Synchronous
Reentrancy	Reentrant
Parameters(in):	ConfigPtr : pointer to configuration set
Parameters(out):	None
Return value:	None
Description:	Initializes the ADC hardware units and driver.

Adc_StartGroupConversion

Name	Adc_StartGroupConversion
Syntax	void Adc_StartGroupConversion(Adc_GroupType Group)
Sync/Async:	Asynchronous
Reentrancy	Reentrant
Parameters(in):	Group: ADC Channel group
Parameters(out):	None
Return value:	None
Description:	Starts the conversion of all channels of the requested ADC Channel group.

Adc_ReadGroup

Name	Adc_ReadGroup
Syntax	Std_ReturnType Adc_ReadGroup(Adc_GroupType Group, Adc_ValueGroupType* DataBufferPtr)
Sync/Async:	Synchronous
Reentrancy	Reentrant
Parameters(in):	Group: ADC Channel group
Parameters(out):	DataBufferPtr: ADC results of all channels of the selected group are stored in the data buffer addressed with the pointer.
Return value:	Std_ReturnType: E_OK: results are available and written to the data buffer E_NOT_OK: no results are available or development error occured
Description:	Reads the group conversion result of the last completed conversion

4- CAN

Can_Init

Name	Can_Init
Syntax	void Can_Init(const Can_ConfigType* Config)
Sync/Async:	Synchronous
Reentrancy	Non Reentrant
Parameters(in):	Config: Pointer to driver configuration.
Parameters(out):	DataBufferPtr: ADC results of all channels of the selected group are stored in the data buffer addressed with the pointer.
Return value:	Std_ReturnType: E_OK: results are available and written to the data buffer E_NOT_OK: no results are available or development error occured
Description:	initializes the module

Can_SetBaudrate

Name	Can_SetBaudrate
Syntax	Std_ReturnType Can_SetBaudrate(uint8 Controller, uint16 BaudRateConfig)
Sync/Async:	Synchronous
Reentrancy	Reentrant for different Controllers. Non reentrant for the same Controller.
Parameters(in):	Controller: CAN controller, whose baud rate shall be set
	BaudRateConfig
Parameters(out):	None
Return value:	Std_ReturnType: E_OK: Service request accepted, setting of (new) baud rate started E_NOT_OK: Service request not accepted
Description:	set the baud rate configuration of the CAN controller

Can_EnableControllerInterrupts

Name	Can_EnableControllerInterrupts
Syntax	void Can_EnableControllerInterrupts(uint8 Controller)
Sync/Async:	Synchronous
Reentrancy	Reentrant
Parameters(in):	Controller: CAN controller for which interrupts shall be re-enabled
Parameters(out):	None.
Return value:	None
Description:	enables all allowed interrupts

Can_Write

Name	Can_Write
Syntax	Std_ReturnType Can_Write(Can_HwHandleType Hth, const Can_PduType* PduInfo)
Sync/Async:	Synchronous
Reentrancy	Reentrant
Parameters(in):	Hth: information which HW-transmit handle shall be used for transmit. Implicitly this is also the information about the controller to use because the Hth numbers are unique inside one hardware unit.
	PduInfo: Pointer to SDU user memory, Data Length and Identifier.
Parameters(out):	None
Return value:	Std_ReturnType: E_OK: Write command has been accepted E_NOT_OK: development error occurred
Description:	pass a CAN message to CanDrv for transmission

HAL Layer

LSW_Init

Name	LSW_Init
Syntax	void LSW_Init (const Port_ConfigType* ConfigPtr)
Sync/Async:	Synchronous
Reentrancy	Non Reentrant
Parameters(in):	ConfigPtr : pointer to configuration set
Parameters(out):	None
Return value:	None
Description:	Initializes the port at which the switch will be connected

LSW_GetState

Name	LSW_GetState
Syntax	Dio_LevelType LSW_GetState (Dio_ChannelType SwId)
Sync/Async:	Synchronous
Reentrancy	Reentrant
Parameters(in):	SwId
Parameters(out):	None
Return value:	Dio_LevelType
Description:	Return the value of the specified Switch

LSW_Update

Name	LSW_Update
Syntax	void LSW_Update (Dio_ChannelType SwId)
Sync/Async:	Synchronous
Reentrancy	Reentrant
Parameters(in):	SwId
Parameters(out):	None
Return value:	None
Description:	update the specified Switch state

SpSens_Init

Name	SpSens_Init
Syntax	void SpSens_Init(Dio_PortType Port, Dio_PinType Pin)
Sync/Async:	Synchronous
Reentrancy	Reentrant
Parameters(in):	Port number Pin Number
Parameters(out):	None
Return value:	None
Description:	Initializes the speed sensor.

SpSens_GetSpeed

Name	SpSens_GetSpeed
Syntax	Uint16 SpSens_GetSpeed (Dio_PortType Port, Dio_PinType Pin)
Sync/Async:	Synchronous
Reentrancy	Reentrant
Parameters(in):	ConfigPtr : pointer to configuration set
Parameters(out):	None
Return value:	The speed value
Description:	Initializes the speed sensor.

DSens_Init

Name	DSens_Init
Syntax	void DSens_Init (const Port_ConfigType* ConfigPtr)
Sync/Async:	Synchronous
Reentrancy	Non Reentrant
Parameters(in):	ConfigPtr : pointer to configuration set
Parameters(out):	None
Return value:	None
Description:	Initializes the port at which the Door sensor will be connected

DSens_GetState

Name	DSens_GetState
Syntax	Dio_LevelType DSens_GetState (Dio_ChannelType DoorId)
Sync/Async:	Synchronous
Reentrancy	Reentrant
Parameters(in):	DoorId
Parameters(out):	None
Return value:	Dio_LevelType
Description:	Return the state of the Door sensor

BCM_Init

Name	BCM_Init
Syntax	void BCM_Init (const ComM_ConfigType* ConfigPtr)
Sync/Async:	Synchronous
Reentrancy	Non Reentrant
Parameters(in):	ConfigPtr : pointer to configuration set
Parameters(out):	None
Return value:	None
Description:	Initializes the communication manager

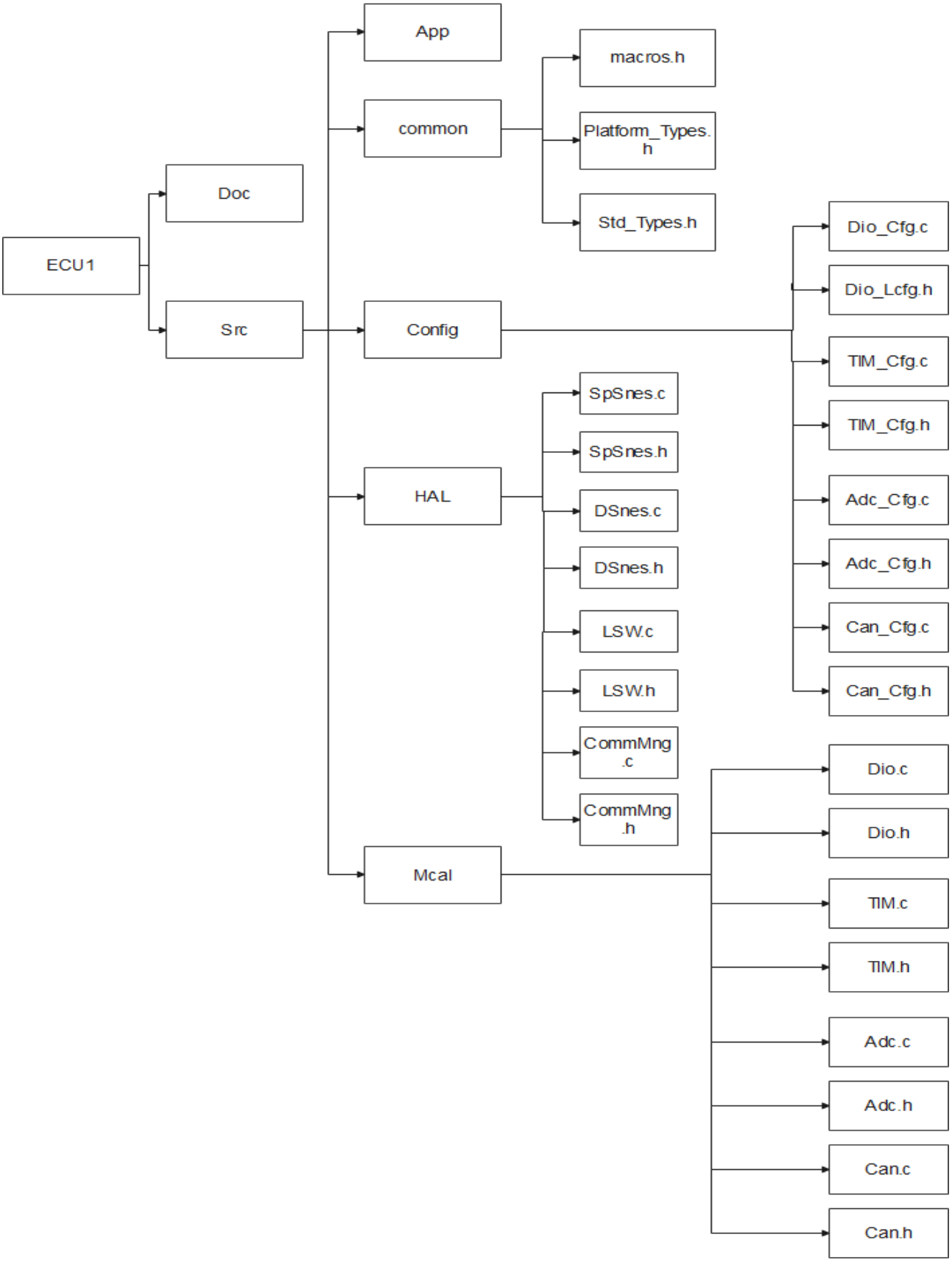
BCM_GetData

Name	BCM_GetData
Syntax	Uint8 BCM_GetData (uint8 BCMId, Uint8*pdata)
Sync/Async:	Synchronous
Reentrancy	Reentrant
Parameters(in):	BCMId : numeric id to determine which comm protocol is used pdata: pointer to data location
Parameters(out):	None
Return value:	Uint8 data length to be read
Description:	Return the received data length

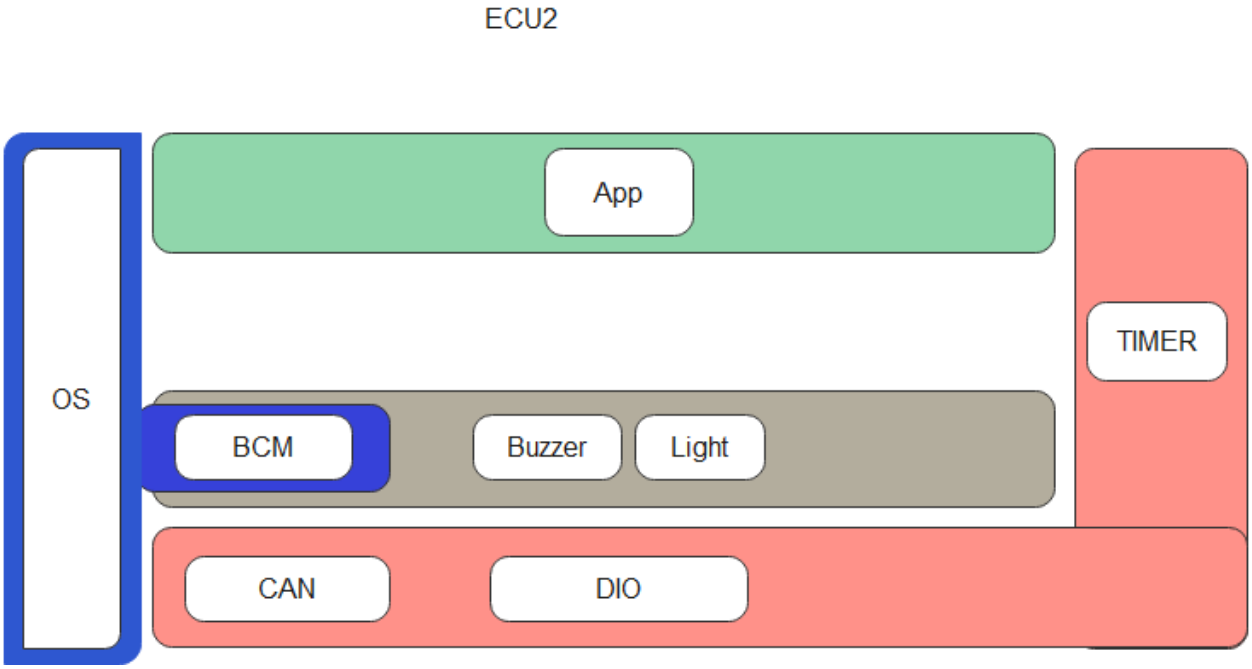
BCM_SetData

Name	BCM_SetData
Syntax	void BCM_SetData (uint8 BCMId, uint8 *pdata, uint8 len)
Sync/Async:	Synchronous
Reentrancy	Reentrant
Parameters(in):	BCMId : numeric id to determine which comm protocol is used pdata: data to be sent len: length of data
Parameters(out):	None
Return value:	void
Description:	Send data over a dedicated communication bus

Folder structure



Layered architecture



ECU Components and Modules

7. OS
    - OS_Init
    - OS_Update
8. Time
    - TIM_Init
    - TIM_GetTime
    - TIM_GetMod
9. Buzzer
    - BUZ_Init
    - BUZZ_Update
    - BUZZ_GetState
10. Light
    - Light_Init
    - Light_Update
    - Light_GetState
11. BCM
    - BCM_Init
    - BCM_GetData
    - BCM_SetData

Modules for ECU1

Typedefs

TIM_ValueType

Name	TIM_ValueType
Type	uint
Range	The range of this type is µC dependent (width of the timer register) and has to be described by the supplier.
Description:	Type for reading and setting the timer values (in number of ticks).

TIM_ModeType

Name	TIM_ModeType
Type	Enum
Range	TIM_MOD_NORMAL: Normal operation mode of the Timer TIM_MOD_SLEEP: Operation for reduced power operation mode. In sleep mode only wakeup capable channels are available.
Description:	Select different power mode

TIM_ChannelType

Name	TIM_ChannelType
Type	uint
Range	The range of this type is µC and application dependent
Description:	Numeric ID for channel timer

Dio_LevelType

Name	Dio_LevelType
Type	uint8
Range	STD_LOW 0V STD_HIGH 5V or 3.3V
Description:	These are the possible levels a DIO channel can have (input or output)

Dio_PortType

Name	Dio_PortType
Type	uint8
Range	Shall cover all available DIO Ports.
Description:	Numeric ID of a DIO port.

Dio_ChannelType

Name	Dio_ChannelType
Type	uint
Range	Shall cover all available DIO channels
Description:	Numeric ID of a DIO channel.

Can_HwHandleType

Name	Can_HwHandleType
Type	uint8, uint16
Range	Shall cover all available DIO channels
Description:	Numeric ID of a DIO channel.

MCAL Layer API's

5- Timer

TIM_Init

Name	TIM_Init
Syntax	void TIM_Init(const Gpt_ConfigType* ConfigPtr)
Sync/Async:	Synchronous
Reentrancy	Non Reentrant
Parameters(in):	ConfigPtr : pointer to configuration set
Parameters(out):	None
Return value:	None
Description:	Initializes the hardware timer module.

TIM_GetTime

Name	TIM_GetTime
Syntax	TIM_ValueType TIM_GetTime (TIM_ChannelType Channel)
Sync/Async:	Synchronous
Reentrancy	Reentrant
Parameters(in):	Channel : Numeric id for timer channel
Parameters(out):	None
Return value:	TIM_ValueType : Elapsed timer value (in number of ticks)
Description:	Returns the time already elapsed.

TIM_GetMod

Name	TIM_GetMod
Syntax	TIM_ModeType TIM_GetMod (TIM_ChannelType Channel)
Sync/Async:	Synchronous
Reentrancy	Reentrant
Parameters(in):	Channel : Numeric id for timer channel
Parameters(out):	None
Return value:	TIM_ModeType : mode of timer channel
Description:	Returns the timer mode

6- DIO

Dio_ReadChannel

Name	Dio_ReadChannel
Syntax	Dio_LevelType Dio_ReadChannel(Dio_ChannelType ChannelId)
Sync/Async:	Synchronous
Reentrancy	Reentrant
Parameters(in):	ChannelId
Parameters(out):	None
Return value:	Dio_LevelType
Description:	Return the value of the specified channel

Dio_WriteChannel

Name	Dio_WriteChannel
Syntax	Dio_LevelType Dio_WriteChannel(Dio_ChannelType ChannelId, Dio_LevelType level)
Sync/Async:	Synchronous
Reentrancy	Reentrant
Parameters(in):	ChannelId
	level
Parameters(out):	None
Return value:	None
Description:	Set the level of a channel

7- CAN

Can_Init

Name	Can_Init
Syntax	void Can_Init(const Can_ConfigType* Config)
Sync/Async:	Synchronous
Reentrancy	Non Reentrant
Parameters(in):	Config: Pointer to driver configuration.
Parameters(out):	DataBufferPtr: ADC results of all channels of the selected group are stored in the data buffer addressed with the pointer.

Return value:	Std_ReturnType: E_OK: results are available and written to the data buffer E_NOT_OK: no results are available or development error occured
Description:	initializes the module

Can_SetBaudrate

Name	Can_SetBaudrate
Syntax	Std_ReturnType Can_SetBaudrate(uint8 Controller, uint16 BaudRateConfig)
Sync/Async:	Synchronous
Reentrancy	Reentrant for different Controllers. Non reentrant for the same Controller.
Parameters(in):	Controller: CAN controller, whose baud rate shall be set
	BaudRateConfig
Parameters(out):	None
Return value:	Std_ReturnType: E_OK: Service request accepted, setting of (new) baud rate started E_NOT_OK: Service request not accepted
Description:	set the baud rate configuration of the CAN controller

Can_EnableControllerInterrupts

Name	Can_EnableControllerInterrupts
Syntax	void Can_EnableControllerInterrupts(uint8 Controller)
Sync/Async:	Synchronous
Reentrancy	Reentrant
Parameters(in):	Controller: CAN controller for which interrupts shall be re-enabled
Parameters(out):	None.
Return value:	None
Description:	enables all allowed interrupts

Can_Write

Name	Can_Write
Syntax	Std_ReturnType Can_Write(Can_HwHandleType Hth, const Can_PduType* PduInfo)
Sync/Async:	Synchronous
Reentrancy	Reentrant
Parameters(in):	Hth: information which HW-transmit handle shall be used for transmit. Implicitly this is also the information about the controller to use because the Hth numbers are unique inside one hardware unit.
	PduInfo: Pointer to SDU user memory, Data Length and Identifier.

Parameters(out):	None
Return value:	Std_ReturnType: E_OK: Write command has been accepted E_NOT_OK: development error occurred
Description:	pass a CAN message to CanDrv for transmission

HAL Layer

BUZZ_Init

Name	BUZ_Init
Syntax	void BUZ_Init (const Port_ConfigType* ConfigPtr)
Sync/Async:	Synchronous
Reentrancy	Non Reentrant
Parameters(in):	ConfigPtr : pointer to configuration set
Parameters(out):	None
Return value:	None
Description:	Initializes the port at which the buzzer will be connected

BUZ_Update

Name	BUZ_Update
Syntax	void BUZ_Update (Dio_ChannelType BUZId, bool val)
Sync/Async:	Synchronous
Reentrancy	Reentrant
Parameters(in):	BUZId: buzzer port pin Val : On/Off
Parameters(out):	None
Return value:	None
Description:	update the buzzer state(On/Off)

BUZ_GetState

Name	BUZ_GetState
Syntax	bool BUZ_GetState (Dio_ChannelType BUZId)
Sync/Async:	Synchronous
Reentrancy	Reentrant
Parameters(in):	BUZId : buzzer port pin
Parameters(out):	None
Return value:	The state of the buzzer On/Off
Description:	Returns the buzzer state

Light_Init

Name	Light_Init
Syntax	void Light_Init(const Port_ConfigType* ConfigPtr)
Sync/Async:	Synchronous
Reentrancy	Reentrant
Parameters(in):	ConfigPtr : pointer to configuration set
Parameters(out):	None
Return value:	None
Description:	Initializes Lights.

Light_Update

Name	Light_Update
Syntax	void Light_Update (Dio_ChannelType LId, bool val)
Sync/Async:	Synchronous
Reentrancy	Reentrant
Parameters(in):	LId: Light port pin Val : On/Off
Parameters(out):	None
Return value:	None
Description:	update the Light state(On/Off)

Light_GetState

Name	Light_GetState
Syntax	bool Light_GetState (Dio_ChannelType LId)
Sync/Async:	Synchronous
Reentrancy	Reentrant
Parameters(in):	Lid : Light port pin
Parameters(out):	None
Return value:	The light state (On/Off)
Description:	Returns the state of the light

BCM_Init

Name	BCM_Init
Syntax	void BCM_Init (const ComM_ConfigType* ConfigPtr)
Sync/Async:	Synchronous
Reentrancy	Non Reentrant

Parameters(in):	ConfigPtr : pointer to configuration set
Parameters(out):	None
Return value:	None
Description:	Initializes the communication manager

BCM_GetData

Name	BCM_GetData
Syntax	Uint8 BCM_GetData (uint8 BCMId, Uint8*pdata)
Sync/Async:	Synchronous
Reentrancy	Reentrant
Parameters(in):	BCMId : numeric id to determine which comm protocol is used pdata: pointer to data location
Parameters(out):	None
Return value:	Uint8 data length to be read
Description:	Return the received data length

BCM_SetData

Name	BCM_SetData
Syntax	void BCM_SetData (uint8 BCMId, uint8 *pdata, uint8 len)
Sync/Async:	Synchronous
Reentrancy	Reentrant
Parameters(in):	BCMId : numeric id to determine which comm protocol is used pdata: data to be sent len: length of data
Parameters(out):	None
Return value:	void
Description:	Send data over a dedicated communication bus

Folder structure