



ANR029 CALYPSO REMOTE GPIO

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1 Introduction

The Calypso WLAN module developed by Würth Elektronik eiSos is intended to be used as a radio sub-system in order to provide WLAN (IEEE 802.11) communication capabilities to systems. The UART acts as the primary interface between the module and a host micro-controller. The module can be fully configured and controlled using a set of AT-commands sent as messages via UART. Once configured, the module independently manages WLAN connectivity allowing the host controller to utilize its resources for its application tasks.

From firmware version 2.0.0 onwards, the Calypso supports the so-called "Remote GPIO" feature, which allows the configuration and control of up to 4 module GPIOs via Wi-Fi, without any intervention of a host controller. This application note gives a short overview of the new feature.

The following pins of Calypso can be configured and controlled remotely:

ID	Pad	Name	Chipset pin	Supported pin functions
0	8	<i>REMOTE_0</i>	GPIO12	Input, output
1	19	<i>REMOTE_1</i>	GPIO5	Input, output
2	24	<i>REMOTE_2</i>	GPIO10	Input, output, PWM
3	25	<i>REMOTE_3</i>	GPIO11	Input, output, PWM

Table 1: Supported pins

2 Functional description

Using the "Remote GPIO" feature of the Calypso, it is possible to set each of the supported GPIOs to output HIGH or LOW, as well as to read the externally applied logic level (i.e HIGH or LOW), in case it has been configured as input pin before. Two of the four pins can act as a PWM instead of the digital input or digital output function.

Furthermore, there is the option to store the GPIO configuration in flash memory (non-volatile), so that it is retained after a device restart. Otherwise the configuration is volatile.

The remote GPIOs can be controlled either using AT commands sent to the radio module via UART or using web API requests.

2.1 Configuration and control using AT commands

There are two AT commands to control the remote GPIOs, `AT+gpioSet` and `AT+gpioGet`.

2.1.1 AT+gpioSet

The command `AT+gpioSet` is used to configure the GPIO:

Request	Response
AT+gpioSet=[id],[save],[type],[value1],[value2]	OK or error
Arguments: See Table 3	

Table 2: AT+gpioSet

Arguments	value
id	ID of the GPIO (see Table 1)
save	false - Apply only during runtime (volatile), true - Apply and save as default (non-volatile)
type	see Table 4
value1	depends on type value, see Table 4
value2	depends on type value, see Table 4

Table 3: AT+gpioSet arguments

type	value1	value2
unused	-	-
input	nopull pulldown pullup	-
output	low, high	-
pwm	PWM period (1-200) [ms]	PWM ratio (0-100) [%]

Table 4: AT+gpioSet GPIO type and valueX arguments



The flash memory used to store these settings has a limited count of write cycles. Try to avoid periodic saving to flash as each time one write cycle is used. Saving in non-volatile memory happens when using AT+gpioSet with the "save" parameter's value set to true.

Example:

Set pin *REMOTE_0* to output high, *REMOTE_1* to input pulldown and *REMOTE_2* to PWM with 100 ms interval and 75 % ratio. Furthermore, save the settings in flash.

```
AT+gpioSet=0,true,output,high,  
OK  
AT+gpioSet=1,true,input,pulldown,  
OK  
AT+gpioSet=2,true,pwm,100,75  
OK
```

Code 1: Example AT+gpioSet part 1

Then toggle the pin *REMOTE_0* two times without saving it in flash.

```
AT+gpioSet=0,false,output,low,  
OK  
AT+gpioSet=0,false,output,high,
```

OK

Code 2: Example AT+gpioSet part 2

2.1.2 AT+gpioGet

The command AT+gpioGet is used to read the current configuration and value of the GPIO:

Request	Response
AT+gpioGet=[id],[default]	+gpioget:[id],[type],[value1],[value2] OK or error
Arguments: id: ID of the GPIO (see Table 1) default: true = default setting, false = current value	id: ID of the GPIO type, value1, value2: see Table 4

Table 5: AT+gpioGet

Example:

Read the current configuration stored in flash:

```
AT+gpioGet=0,true
+gpioget:0,output,high,
OK
AT+gpioGet=1,true
+gpioget:1,input,low,pulldown
OK
AT+gpioGet=2,true
+gpioget:2,pwm,100,75
OK
AT+gpioGet=3,true
+gpioget:3,unused,,
OK
```

Code 3: Example AT+gpioGet part 1

The pin *REMOTE_0* is configured as output high, *REMOTE_1* as input pulldown with low level applied, *REMOTE_2* as PWM with 100 ms interval and 75 % ratio, and *REMOTE_3* as unused pin.

Then externally apply a high signal to pin *REMOTE_1* and read its value again:

```
AT+gpioGet=1,false
+gpioget:1,input,high,pulldown
OK
```

Code 4: Example AT+gpioGet part 2

2.2 Configuration and control via web interface

The on-board web server on the Calypso provides web pages that allow configuration and control of the remote GPIOs. The on-board remote GPIO configuration page can be reached from any device through a web browser.

- In AP mode (provisioning): The device that accesses the website must be connected to the Calypso AP and needs to open "calypso.net/gpio.html".

- In station or P2P mode: The device that accesses the website must be in the same network as the Calypso and needs to open "[module ip]/gpio.html".
For example <http://192.168.1.101/gpio.html> in case the module's IP is 192.168.1.101

This page contains the "GET" and the "SET" tabs.

Figure 1: GPIO GET tab

Figure 2: GPIO SET tab

2.2.1 GPIO Set

In order to set a remote GPIO, in the "SET" tab, select the ID, type and the value from the dropdown menu. Check the "Save" check box to save the configuration in the flash. Finally, click on the "POST" button to send the configuration to the module. On success, the module returns code 204.

2.2.2 GPIO Get

In order to read a remote GPIO, in the "GET" tab, select the ID and runtime/default value from the dropdown menu. Finally, click on the "GET" button to get the configuration from the module. On success, the module returns a JSON string with the current/default state of the remote GPIO.

GPIO

GET **SET**

GPIO SET

ID	1
Type	Input
Save	<input checked="" type="checkbox"/>
Value 1	Pull down

POST

Success: 204: No Content

Figure 3: GPIO SET

GPIO

GET **SET**

GPIO GET

ID	1
Default	Default value

GET

{"id": 1, "type": "input", "input config": "pulldown", "input value": "low"}

Figure 4: GPIO GET



The remote GPIOs on the Calypso can be accessed in all application modes except FOTA mode.



This webpage uses RESTful APIs in order to perform GET and POST requests on remote GPIO resources on the Calypso. A detailed description of these API calls can be found in chapter "The HTTP server interface" of the Calypso user manual [1]

3 References

[1] Würth Elektronik. Calypso user manual. <https://www.we-online.de/katalog/de/manual/2610011025000>.

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