

Graphical User Interface GUI

For EM3028TP14 Extreme Low Power RTC Using USB -- I2C Bus Dongle

3028 RTC Connection COM4		connect	I ² C I ² C Address	: DxA4	. 🔐		electronic	_ - ×
Introduction	General USB-I2C Co	nmands Be	gisters Time, Al	am Time Stamp Timer Pas	EM302	8-TP14 F	TC GUI V2.0.1.3	
Time and Ala	am		golore	The Gamp Third Tae		riogista ricolocati i	an ib bailobala	
Time and A	Alarm (00h;09h, 1Bh;1	Eh]Register S	lettings					
TIME :	24h 💌 Displ	ay Mode						
	HOL	R MIN	SEC	WDAY DATE MO	ITH YEAR		_	
Set	10	58	08	05 23 11	18> EX	ECUTE SET TIM		
Current	10	38	08	FRI 23 DE	, 2018 < RE	AD stop repea	t 🔻	
ALARM :								
Enable	E H	R 🕅 MN		WDAY WADA				
Set	00	00		00 weekday 👻	> EXECUTE	CLEAR AF		
Current	00	00		00	< READ	STATUS AF		
UNIX :						1		
ι	UNIX time decimal		UND 0x1E	Ktime hexadecimal 0x1D 0x1C 0x1B				
	1542967092		5B	F7 CF 34	> EXECUTE	SET TIME		
	1542967092		5B	F7 CF 34	< READ			
eceived Data	3				Clear All Clear	received	smitted Data	Clear transmitted
		UDD FOUT EVI		JUDD - (UDDL FOUT FOUT FOUT SCL SCL TEST USS JUD FOUT			and sales	
		3						

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1. SUMMARY

The growing number of features of Real-time Clocks can optimally be evaluated through an intuitive Graphical User Interface (GUI). To simplify the hardware setup EM offers a kit with the USB port to I²C-Bus dongle and the RTC develoment board. The GUI it is the straight forward approach for communicating with the RTC and monitoring all functions including register and flag settings. The string of applied I²C-Bus commands is reflected in real time as reference for the firmware development. A dedicated mask for communication with other I²C-Bus circuits is provided in addition.

For the correct development board setup, please refer to the specific documentation

- EM3028-TP14_DevelopmentBoard.pdf

Features:

- Ready to run the dongle establishing bidirectional USB to I²C-Bus translation.
- Three parallel wired I²C-Bus ports include also +5 V for supplying power to the development board.
- USB and customized cables for the I²C-Bus are included

2. KEY FUNCTIONS

2.1. HARDWARE: USB-I²C INTERFACE DONGLE

The dongle is a ready to run module. It creates a virtual COM-port via the USB connection. It provides three I²C-Bus connections with optional output of 5 V for powering up the application (max 450 mA).

Power consumption: I²C-Bus clock frequency: USB driver for Windows: Size: Module / total: <50 mA / max 500 mA 245 Hz – 400 kHz Windows XP, Windows 7, Windows 8 50 mm × 40 mm × 15 mm

2.2. SOFTWARE

The software control via a GUI allows a fast setup for communicating with the Real-Time-Clock module. Aside from the detailed GUI pages for the target development board, it allows communicating with any I²C-Bus device by entering directly the data hex codes.

Example: s A4 2A p

Nomenclature: All terms are in hexadecimal format!

- s stands for the I²C START condition
- A4 for the slave address
- 00 for the first data byte to be sent
- p for the I²C STOP condition



3. BRIDGE CIRCUIT USB TO I²C-BUS

3.1. CIRCUIT DIAGRAM OF DONGLE

The block diagram illustrates both connections: to the PC and to the application under evaluation.



Figure 3-1 Dongle Block Diagram

The three connectors CON1, CON2, and CON3 are wired in parallel and carry the four required signals; their order is imprinted on the package:

+5 V: Optional 5 V supply can be used. Total consumption of all 3 outputs must be kept below 450 mA.

- SCL: Serial Clock line *
- SDA: Serial Data line *

GND: Ground

*) : The pull-up resistors are located on the development board





4. INSTALLATION

Use the following sequence:

4.1. SOFTWARE DRIVER

Install the USB software driver provided before connecting the interface module! Unpack the file: i.e *cp210x_vcp_win_xp_s2k3_vista_7_8_v6_6_1.zip* Install the driver in administrator mode, by double click.

4.2. HARDWARE

Connect the USB cable between the Dongle and your PC as well the as the I²C-Bus cable to your target RTC board. In case an external supply voltage is used, make sure it is now turned on. The red LED will light up indicating the dongle successfully started up. The system is now ready for starting the GUI software.

4.3. SOFTWARE GUI

Installation of the GUI

- a) Run the exe file: USB-I2C-EM3028TP14.exe (program name EM3028TP14 is RTC specific)
- b) The start window will pop op (Figure 4-1)
- c) Choose the appropriate com-port from the drop down list (usually the last one on the list)
- d) Press Connect: Status changes to Connected to COMn and turns green

3028 RTC	
Connection COM3 Connect - not connected -	IPC Address: 0xA4 ~~
Introduction General USB-I2C Commands Re	3028 RTC Connection COM10 Connected to COM10 Introduction General USB-I2C Commands Regi

Figure 4-1 Start Window of the GUI



5. OPERATION

The Graphical User Interface is organized by a number of drop-down menus. Specific windows visualize the actual status and allow controlling the specific Micro Crystal RTC-module. In a separate menu (General USB-I2C commands) the GUI can be used as a universal I²C-Bus interface for controlling any peripheral circuit.

5.1. PROCEDURE

The drop-down windows follow a general structure (Figure 5-1)

- 1. Input fields to set e.g. the current time, to start transmission to the RTC press EXECUTE.
- 2. Output fields are updated after the READ button is pressed
- 3. Interactive knobs allow activating different functions or selecting specific parameters
- 4. Monitoring bus transmission: After every executed bus transmission the bus protocol is listed in the field *Transmitted Data*. Any data received by the controller is listed in the field *Received Data*. This is ideal for verifying the code needed for proper execution

3028 RTC		×
Connection	31	
COM10	Disconnect IC Address: 0xA4	
Conne	ted to COM10 EM3028-TP14 RTC GUI V2.0.1.3	
ntroduction Genera	al USB-I2C Commands Registers Time, Alamn Time Stamp Timer Password Power Management Register Readback EM ID Demoboard	
Time and Alarm		
Time and Alarm [0	J0h;09h, 1Bh;1Eh]Register Settings	
TIME : 24h	✓ Display Mode	
	HOUR MIN 1 - Input fields DATE MONTH YEAR 3 - Interactive	
Set	00 00 00 40 00 01 00 EXECUTE SET TIME	
Current	23 26 37 THU 22 DEC 2018 <	
ALARM :	2 - Output fields	
Enable	HR I MN WDAY WADA	
Set	00 00 weekday ~> EXECUTE CLEAR AF	
Current	00 00 < READ STATUS AF	
	1	
UNIX : UNIX tin	ne decimal UNIX time hexadecimal	
0		
335270	00 33 28 7C < BFAD	
	4 – Monitoring the bus protocol	
eceived Data	Clear All Clear received Iransmitted Data Clear transmitted	
26 23 04 22 11 18	s A4 10 s A5 01 p s A4 07 s A5 03 p	^
00 00	s A4 0F s A5 01 p s A4 10 s A5 01 p	
)	s A4 09 s A5 01 p s A4 09 80 p	
)	s A4 08 s A5 01 p s A4 08 80 p	
. 28 33 00 5	s A4 1B s A5 04 p s A4 0E s A5 01 p	~

Figure 5-1 Structure of the GUI



5.2. GENERAL USB I²C-BUS COMMAND

The Universal I²C interface allows controlling any circuit by entering directly the I²C-Bus instructions.

Connected to COM10			EM3	028-TP14	RTC GUI V2	2.0.1.3
Introduction General USB-I2C Commands Rej	isters Time, Alarm Time Sta	mp Timer Passwor	d Power Managemer	nt Register Readba	ck EMID Demo	board
A s A4 02 04 p		> Se	end Command <	- stop repeat	\sim	
B s A4 02 s A5 0A p		> Se	end Command <	- stop repeat	~	
c		> Se	end Command <	- stop repeat	~	
D		> Se	nd Command <	- stop repeat	~	
String ABBAB b		> Se	nd Command <	stop repeat	~	
Reset the dongle		d Sav	e Configuration			
C Reset dongle (Y-Parameters)		e Rea	d Configuration			
Reset USB-I7C						
Status, Himware, Y-Parameter						

Figure 5-2 General USB-I²C Bus Interface

- a) There are 4 command lines A to D for preparing communication. The data format is straight forward
- b) I²C-Bus protocol:
 - e.g.: for sending data: s A4 02 04 p press Send Command

e.g.: for reading data: s A4 02 s 65 0A p: press *Send Command* setting address pointer, then reading 10 bytes (0Ah)

(s = START, A4 = slave address, 02 04 = data, p = STOP)

The command lines can be fired off once per click or repeatedly every 100ms, 1s, 2s, 10s.

- c) The string allows to sequentially firing the above command lines: e.g. A B B D C. When using fast repetition rate it is of good practice to increase the I²C-Bus speed. (Use the T400000 instruction for setting the bus speed to 400kHz, details are shown below under 'Additional instructions')
- d) Reset functions can be executed
- e) Saving the actual configuration on the PC, including all settings on the RTC. Assign a specific name and select a directory.
- f) Reloading of stored settings to continue former tasks.

Additional instructions:

- Space is ignored, letters can be in capital or small.
- Sequences like SA400P or SA4 00 p are interpreted identically
- S I²C-Bus Start condition, also for repetitive start condition
- P I²C-Bus-Bus STOP condition
- L n Inserts a delay of n ms: 1 to 65535ms (n= 0001...FFFF)
- T m Setting the I²C-Bus frequency: minimum 226Hz m= 000226, maximum 409.6kHz m= 409600
- ? System status and settings are read from the dongle



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