

DS-PAGER

Development set for GW-USB-13A

User's Guide



Description

DS-PAGER is a development set for IQRF gateway GW-USB-13A.

The DS-PAGER is intended for development and GW-USB-13A for followed-up production.

GW-USB-13A is a generic module, i.e. the hardware is fixed and functionality is adapted by the user SW only.



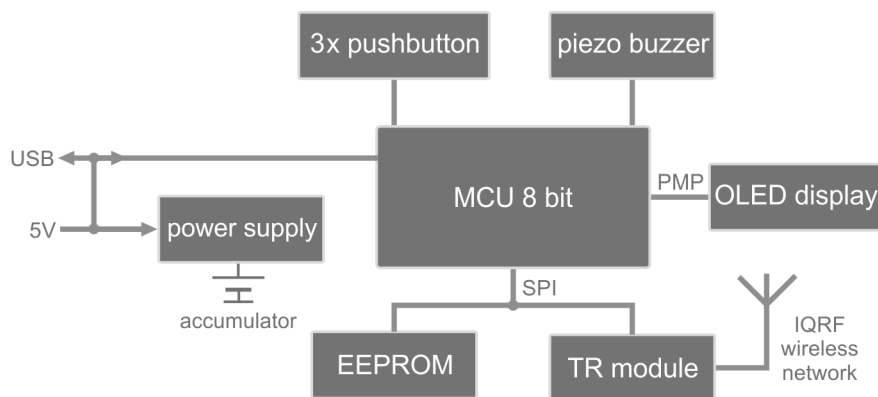
Applications

- Development of GW-USB-13A applications
- Remote controllers and pagers with OLED display

Key features

- GW-USB-13A gateway with USB connectivity, OLED display
- Programming and communication cables
- Datasheets and hardware schematics
- Demo software with source code in C language
- Ready-to-use functions for basic access to peripherals
- Display libraries
- Manufacturer's support

GW-USB-13A block schematics



Electrical specifications

See the GW-USB-13A User's guide.

Hardware

GW-USB-13A is a generic equipment, i.e. the hardware is fixed and the user can realize specific functionality by software only.

Power supply

GW-USB-13A is intended to be supplied via micro USB connector (XC2), either from PC or from the adapter. The accumulator LIP-552240 (3.7 V 400 mAh) serves as a backup for external power and should be charged from it.

MCU

GW is controlled by the 8b microcontroller PIC18F66J55, 24 MIPS, 64 pins.

Oscillators

MCU is clocked by internal 48 MHz RC oscillator using the internal PLL. The secondary crystal oscillator 32.768 kHz is available for RTCC and power consumption minimizing.

Sleep mode

For current consumption minimizing, especially in idle or while supplied from the accumulator, it is possible to switch off all functions and peripherals by SW. Sleep can be invoked by the program and terminated by various methods depended on SW – see below. GW power is not switched off, the Sleep mode is used instead of this.

EEPROM memory

64 kb, serial interface SPI (shared with the TR module), 1 000 000 erase/write cycles (typ.).

Pushbuttons

Functionality of all three pushbuttons is fully under software control.

Beeper

Beeper can be driven from the PWM module output or by software. The functionality is fully under software control.

TR module

The transceiver module is inserted in SIM card connector. User program should be uploaded by an external programmer outside the GW or inside the GW using RF PGM wireless upload (RF PGM should be enabled in external programmer first) – see the AN009 Application note.

Antenna

GW-USB-13A uses the TR module with built-in PCB antenna.

Case

The plastic case is limited to a very few number of open/close cycles only.

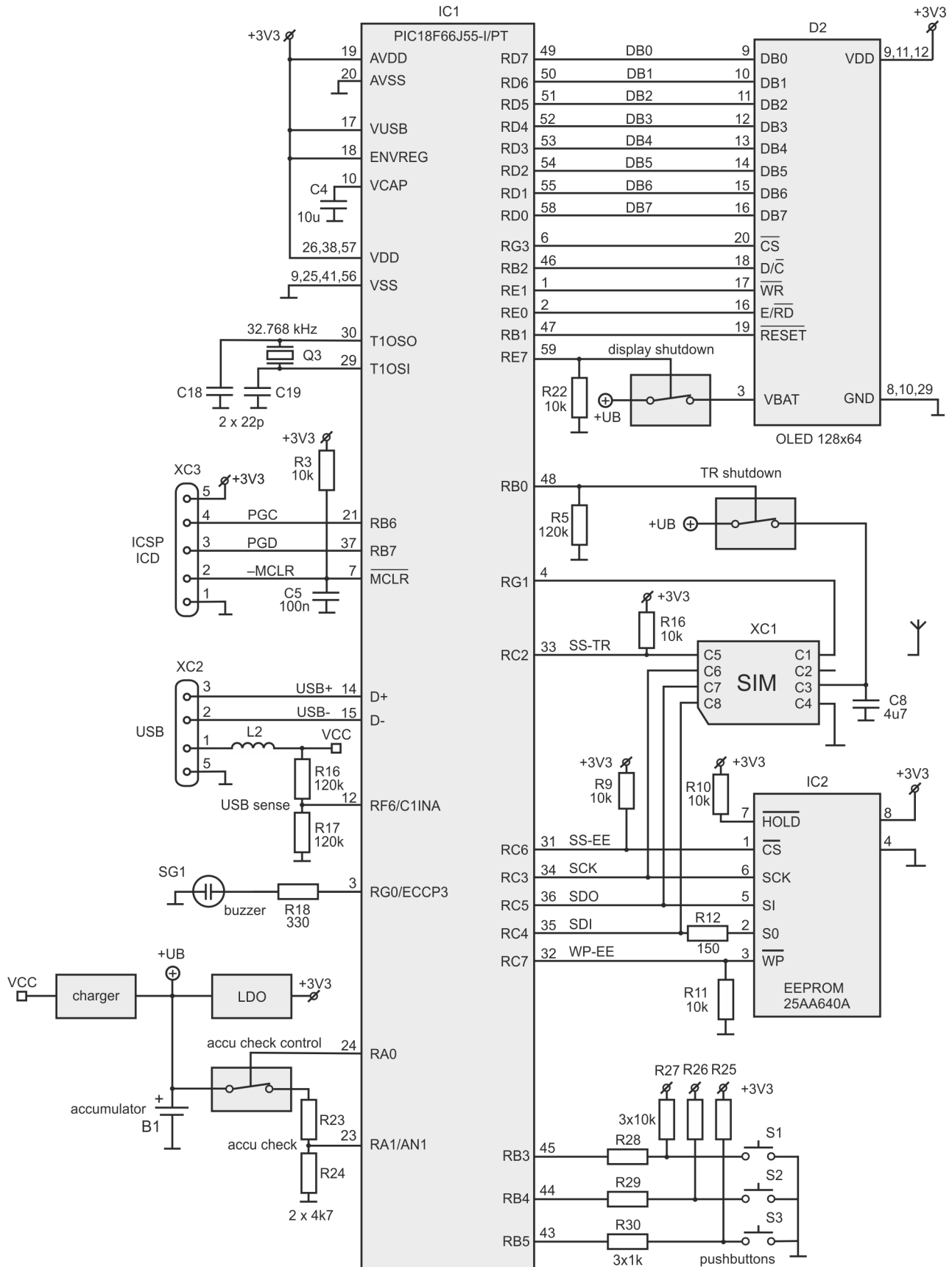
Tip: The TR module can be uploaded via RF PGM with the case closed.

Basic parts

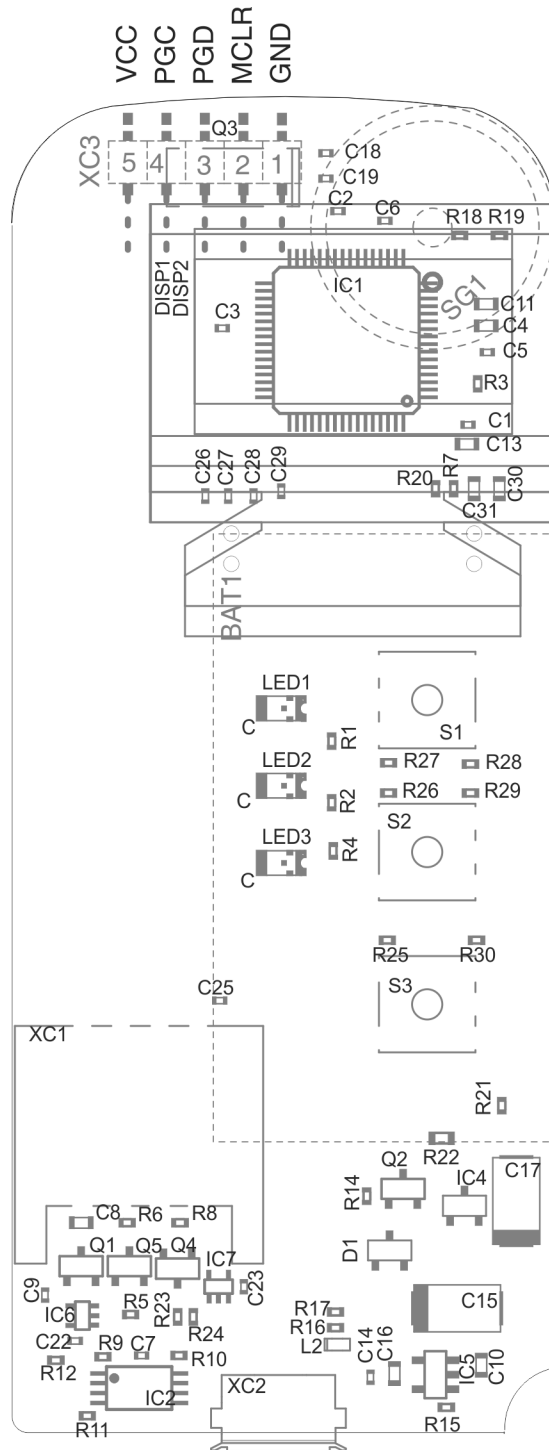
IC	type	reference	manufacturer
MCU	PIC18F66J55	IC1	Microchip
Display controller	SSD1306	D2	Solomon Systech
EEPROM	25AA640A (64 Kb)	IC2	Microchip
TR module	TR-52B	XC1	MICRORISC

For detailed information refer to respective datasheets.

Simplified GW-USB-13A schematics



Board layout

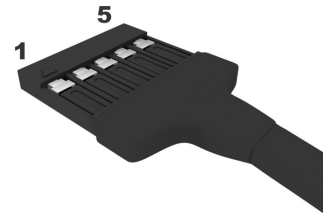


Interfaces and connectors

interface	pins	reference	connector type
USB	5	XC2	Micro USB
Accumulator	2	BAT1	Soldering stripes
Charger	2	XC2	Via Micro USB connector
MCU programming (ICSP) and debugging (ICD)	5	XC3	Cable connector
TR module	8 1	XC1	SIM connector Through hole soldering for antenna connection

Programming and debugging

The Microchip MPLAB ICD3, REAL ICE or other suitable development tool is needed for uploading (“programming”) of the user program into the MCU (ICSP, In-circuit serial programming) and for possible debugging (ICD, In-circuit debugging). This should be connected via the cable included in the DS set to the ICSP/ICD connector. Keep correct pinout according the picture and board layout.



The TR module can be uploaded with a `.hex` code using an IQRF programmer (e.g. CK-USB-04) and the IQRF IDE development environment.

Software

The GW development set is delivered with demo application. It contains:

- Example program for MCU inside the GW (in C language for the C18 compiler by Microchip, as a complete project in the Microchip MPLAB IDE development environment)
- PC example program (source code for the Borland C++ Builder).

This demo should serve as a starting template for any user application. Source codes are commented.

USB communication

The communication is based on the free USB stack v2.3 by Microchip which is available for PIC microcontrollers. Resulting CustomClass equipment will require the USB driver for PC included in the CD attached (and in the IQRF Startup Package as well). It is the same one as for the IQRF IDE. USB communication uses VID 0x1DE6 (MICRORISC) and PID 0x0001. These values are available just for development of user applications. For final products all users have to use their own VID / PID. They can be provided by the GW manufacturer.

Demo application – MCU side

The user can use access to peripherals, menu visualization and setup. The following software functions are available:

- OLED display rolling menu
- USB communication with PC demo application
- EEPROM storing and reading the GW setup
- TR module writing to the communication buffer in the module
- Accumulator voltage A/D conversion and voltage displaying, not calibrated
- Piezo buzzer acoustic indication, predefined tones
- Sleep mode to minimize power consumption or to „switch off“ the equipment
- Pushbuttons menu control

The GW is delivered with soldered accumulator and in the Sleep mode. Sleep is invoked when no pushbutton is pressed in predefined time (20 s default) while powered from accumulator. Wake-up is realized by external power supply connecting or by pushbutton S2 or S3. The GW restores the state before entering the Sleep mode then.

Pushbuttons

- S1: Up
- S2: Down
- S3: Enter

See Board layout and demo source programs.

Main menu

The main rolling menu with seven items. Only one of them (Settings) is active. Setup is saved in EEPROM.

Settings

The Settings submenu items:

Back

Return to Main menu.

About

Information about given GW.

Contrast

Display contrast setup.

Sound

Switching the acoustic indication on/off.

Accu voltage

Displays the accumulator voltage.

Sleep time

Time to enter the Sleep mode while inactive.

Items 6 and 7

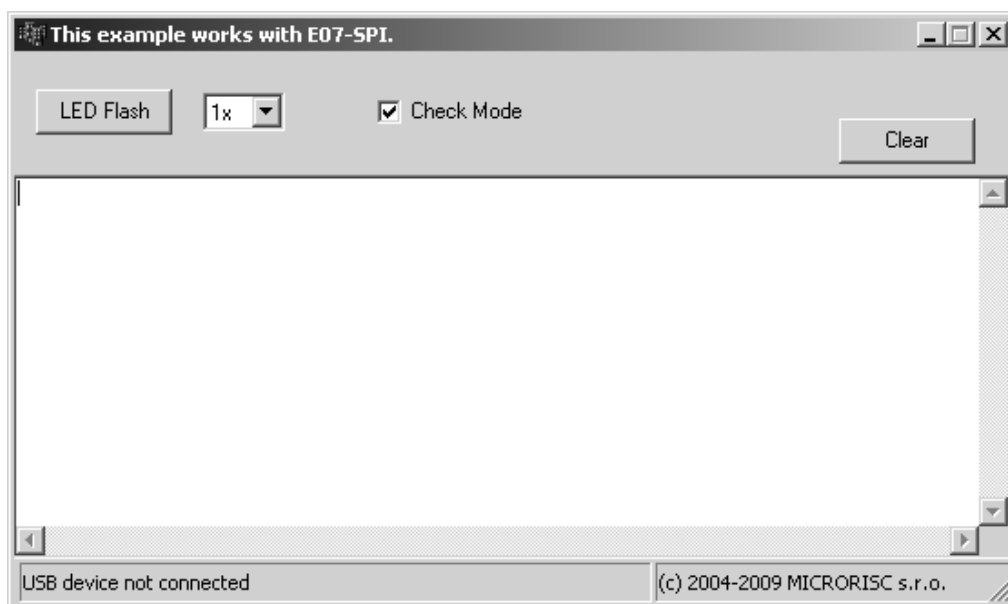
Inactive.

Demo application – PC side

PC example program for USB communication. Complete project with source program for the Borland C++ Builder.

Steps

- Plug the TR module with the E07-SPI application into the GW (the set is delivered with the TR module in this state). E07-SPI see the IQRF Startup Package.
- Leave the GW outside the case (to save the case and watch the LEDs on the TR during development).
- Unpack the `c_builder_example.zip` file to selected directory.
- Connect the GW to PC via micro USB cable
- If you do not use IQRF IDE Windows will require USB driver via standard installation procedure. Navigate to the `.\c_builder_example\USB_Custom_Driver` subdirectory.
- Invoke the `iqrf_pc_example.exe`. The program should start to communicate with the GW – see the picture below.



- The program periodically reads the status of the TR module (it can be controlled via the Check Mode box)
 - Select number of LED flashes and click the *LED Flash* button.
 - Number of flashes of the LED on the TR module should correspond.
- The USB communication is described in source code comments.

Pack list

- GW-USB-13A with Demo application programmed (in Sleep mode)
- TR-52BA with E07-SPI standard example programmed (see the IQRF Startup package), inserted in SIM connector, switching to the RF PGM after reset disabled
- Accumulator (soldered)
- Micro USB cable
- Programming / debugging cable
- CD with software and documentation:
 - Display-OLED-128x64 PDF OLED display datasheet
 - Driver-SSD1306 PDF OLED display driver datasheet
 - DS39775B PDF PIC18F66J55 GW MCU datasheet
 - Microchip_MCHPFSUSB_v2.3_Installer EXE USB framework
 - MNDSPAGER PDF This User's guide
 - MNGWUSB13A PDF GW-USB-13A User's guide
 - MNTYA6A PDF Power supply User's guide
 - GW-USB-13A ZIP Demo application – MCU side
 - c_builder_example ZIP Demo application – PC side

Ordering code

- DS-PAGER Development set for GW-USB-13A, 868 MHz as well as 916 MHz

Other necessary tools

- Programmer/debugger A development kit is necessary.
MPLAB ICD3, REAL ICE or other suitable tool by Microchip is recommended.
- C compiler C18 (Microchip). Free 60-day evaluation. See licence conditions for details.

Document history

- 120313 Updated for GW-USB-13A with OLED 128x64
- 100726 First release

Sales and Service

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Complies with FCC directives FCC CFR, Title 47, Part 15, Section 15.209, FCC CFR, Title 47, Part 15, Section 15.249

Complies with Directive 2002/95/EC (RoHS)



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