IRMP on STM32 - a USB IR receiver/sender/powerswitch with wakeup-timer

A remote control receiver with many functions based on cheap hardware.

Introduction

For 4 - 8 € you can buy on ebay a ST-Link emulator or a STM32F103 development board, manufactured in China usually. Onto the STM32F103 mikrocontroller on it an open source firmware with many functions will be flashed.

Functions

- connection via USB
- registers as HID device, no driver needed, appears as /dev/hidraw or "Custom HID device"
- transfers the data via USB2 in hardware with fullspeed
- IR receiver (ca. 40 protocols decoded in hardware)
- switch PC on via remote control from S3 (STR) and S4 (STD) via USB or from S3, S4 and S5 (SoftOff) via motherboard-switch (+5V needed, on USB or from PSU or motherboard)
- switch PC on via build in timer from S3 (STR) and S4 (STD) via USB or from S3, S4 and S5 (SoftOff) via motherboard-switch (+5V needed, on USB or from PSU or motherboard)
- IR sender (ca. 40 protocols)
- the configuration is stored in the emulated eeprom
- within eeprom size any number of macros with any depth and any number of wakeups: MACRO_SLOTS x (MACRO_DEPTH + 1) + WAKE_SLOTS < 85 for F103, < 170 for F105
- bootloader for comfortable firmware update

A macro enables sending a sequence of commands via the IR-senddiode on reception of a keypress. macroslot0 is the trigger, macroslot1 … macroslot7 are the commands, to be send on reception of the trigger.

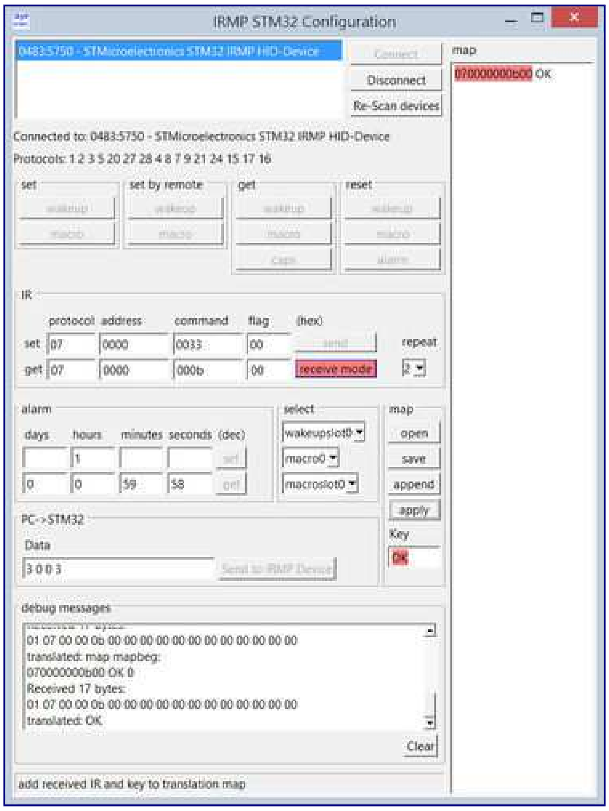
Software Linux

- GUI config-tool stm32IRconfig_gui for configuration: set, get and reset wakeup codes, macros, alarm time, send IR and show the received IR code. It is possible to program wakeups and macros via remote control. Create the translation table with remote control and mouse, as well test and edit. Comprehensive debug messages.
- command line program stm32IRconfig for configuration: set, get and reset wakeup code, macros, alarm time, send IR and show the received IR code. It is possible to program wakeups and macros via remote control.
- stm32IRalarm for setting and reading alarm time via script

- irmplircd is a daemon, running in background as an independent lirc server and passing the IR codes/events on to the application https://github.com/realglotzi/irmplircd
- irctl for configuration: https://github.com/olebowle/irctl

Software Windows

- GUI config-tool stm32IRconfig_gui (same as linux)
- command line programm stm32IRconfig (same as linux)
- stm32IRalarm for setting and reading alarm time via script
- MediaPortal plugin: https://github.com/pikim/HIDIRT-host/tree/master/hidirt.MePo
- EventGhost with Generic HID



0483:5750 - STMicroelectronics STM32 IRMP HID-Device

map: 070000000b00 OK

Connected to: 0483:5750 - STMicroelectronics STM32 IRMP HID-Device

Protocols: 1 2 3 5 20 27 28 4 8 7 9 21 24 15 17 16

IR

	protocol	address	command	flag	(hex)
set	07	0000	0033	00	send
get	07	0000	000b	00	receive mode

repeat: 2

alarm

days	hours	minutes	seconds	(dec)
	1			set
0	0	59	58	get

select: wakeupslot0, macro0, macroslot0

PC->STM32

Data: 3 0 0 3

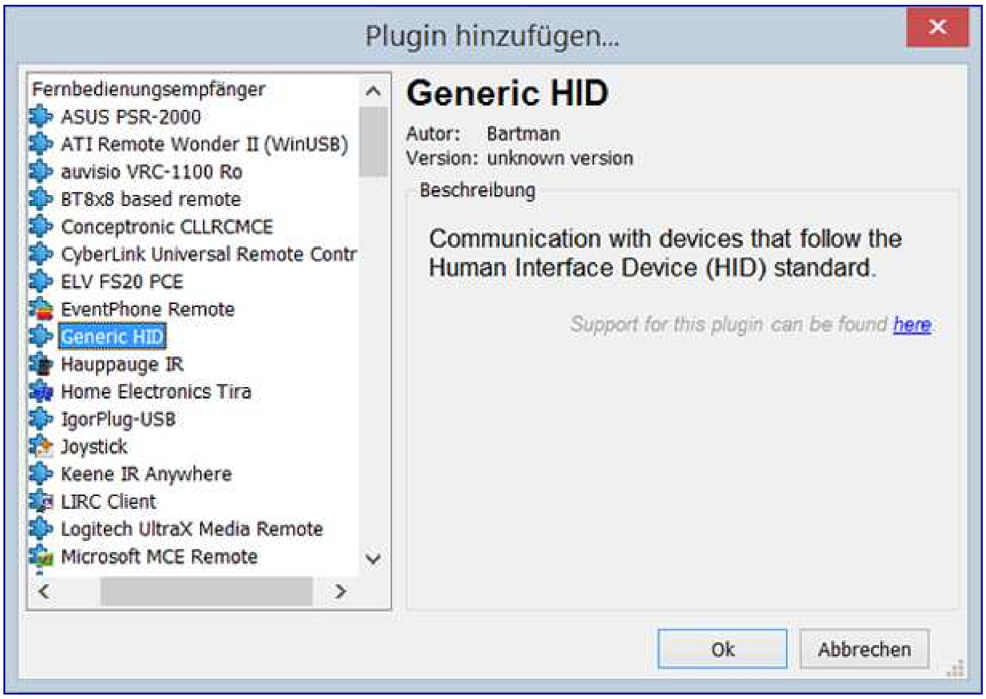
Key: OK

debug messages

```
01 07 00 00 0b 00 00 00 00 00 00 00 00 00 00 00 00
translated: map mapbeg:
070000000b00 OK 0
Received 17 bytes:
01 07 00 00 0b 00 00 00 00 00 00 00 00 00 00 00 00
translated: OK
```

add received IR and key to translation map

The stm32IRconfig_gui canbe used i.e. for building irmp_stm32.map with the remote control: receive mode, press key on remote, enter key name into textfield Key and press append. After pressing apply you can test.



Plugin hinzufügen...

Fernbedienungsempfänger
- ASUS PSR-2000
- ATI Remote Wonder II (WinUSB)
- auvisio VRC-1100 Ro
- BT8x8 based remote
- Conceptronic CLLRCMCE
- CyberLink Universal Remote Contr
- ELV FS20 PCE
- EventPhone Remote
- Generic HID
- Hauppauge IR
- Home Electronics Tira
- IgorPlug-USB
- Joystick
- Keene IR Anywhere
- LIRC Client
- Logitech UltraX Media Remote
- Microsoft MCE Remote

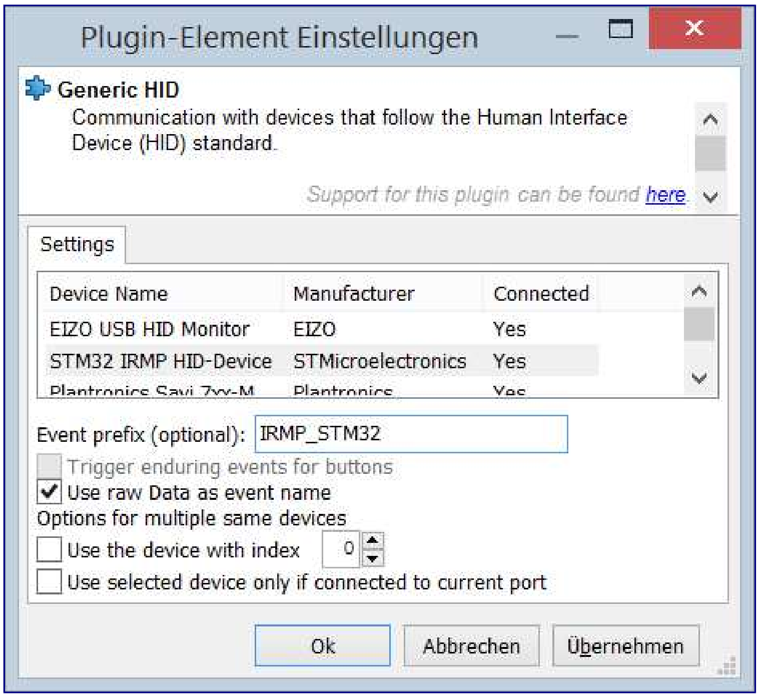
Generic HID

Autor: Bartman
Version: unknown version

Beschreibung

Communication with devices that follow the Human Interface Device (HID) standard.

Support for this plugin can be found here



Plugin-Element Einstellungen

Generic HID
Communication with devices that follow the Human Interface Device (HID) standard.

Support for this plugin can be found here

Settings

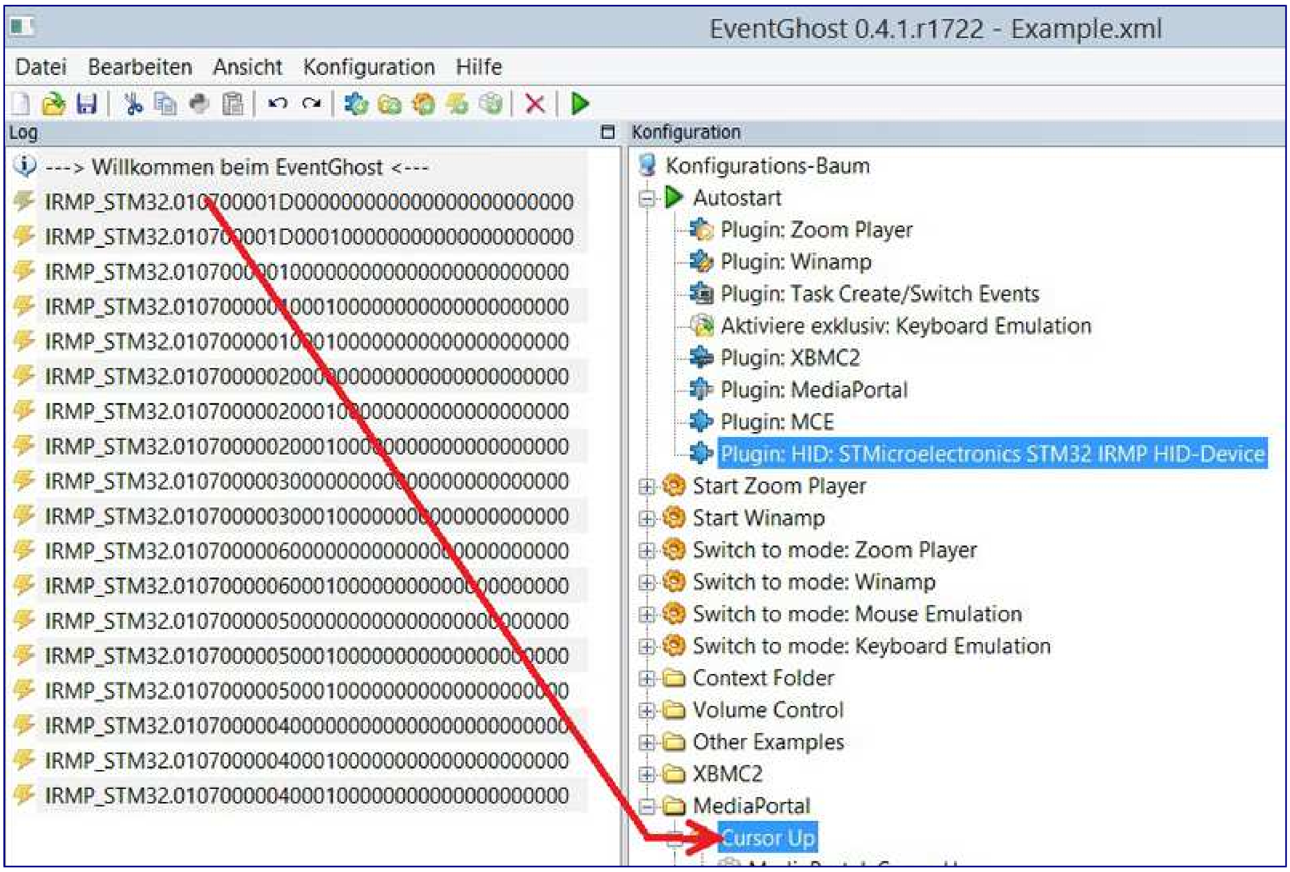
Device Name	Manufacturer	Connected
EIZO USB HID Monitor	EIZO	Yes
STM32 IRMP HID-Device	STMicroelectronics	Yes
Plantronics Savi 7xx-M	Plantronics	Yes

Event prefix (optional): IRMP_STM32

□ Trigger enduring events for buttons
☑ Use raw Data as event name

Options for multiple same devices

□ Use the device with index 0
□ Use selected device only if connected to current port



```
---> Willkommen beim EventGhost <---
IRMP_STM32.010700001D000000000000000000000000
IRMP_STM32.010700001D000100000000000000000000
IRMP_STM32.0107000010000000000000000000000000
IRMP_STM32.0107000010000100000000000000000000
IRMP_STM32.0107000010000100000000000000000000
IRMP_STM32.0107000020000000000000000000000000
IRMP_STM32.0107000020000100000000000000000000
IRMP_STM32.0107000020000100000000000000000000
IRMP_STM32.0107000030000000000000000000000000
IRMP_STM32.0107000030000100000000000000000000
IRMP_STM32.0107000060000000000000000000000000
IRMP_STM32.0107000060000100000000000000000000
IRMP_STM32.0107000050000000000000000000000000
IRMP_STM32.0107000050000100000000000000000000
IRMP_STM32.0107000050000100000000000000000000
IRMP_STM32.0107000040000000000000000000000000
IRMP_STM32.0107000040000100000000000000000000
IRMP_STM32.0107000040000100000000000000000000
```

```
Konfigurations-Baum
  Autostart
    Plugin: Zoom Player
    Plugin: Winamp
    Plugin: Task Create/Switch Events
    Aktiviere exklusiv: Keyboard Emulation
    Plugin: XBMC2
    Plugin: MediaPortal
    Plugin: MCE
    Plugin: HID: STMicroelectronics STM32 IRMP HID-Device
  Start Zoom Player
  Start Winamp
  Switch to mode: Zoom Player
  Switch to mode: Winamp
  Switch to mode: Mouse Emulation
  Switch to mode: Keyboard Emulation
  Context Folder
  Volume Control
  Other Examples
  XBMC2
  MediaPortal
    Cursor Up
```

A keycode in the left event-window is pulled via drag&drop into the right configuration-window and assigned to the wanted action of a plugin.

Download

https://github.com/j1rie/IRMP_STM32
The sources are complete only after running the prepare script, the script downloads the ST- and IRMP-sources, extracts and patches them.
This makes it possible to put the patches under GPL, without interfering with the original licences.
It is easier to see, what has been changed, too.

Pin-Out

IR send diode - PB6
logging - PB10 = Tx, connect to Rx of USB-serial-TTL
F103:
IR TSOP – PB11
power on switch motherboard - PB14 and via USB
toggle LED - PB13
Wakeup reset - PB12
USB disconnect - PB15
F105:
IR TSOP - PC6
power on switch motherboard - PB7 and via USB

toggle LED - PB12
Wakeup reset - PB8

Firmware Compilation

Linux: arm-none-eabi-gcc
Windows: Coocox CoIDE (uses arm-none-eabi-gcc too)
http://www.olliw.eu/2013/stm32-this-and-that/#coocoxinstall

Firmware Flashing

flash firmware with USB-serial-TTL (STM32F103):
connect ground and 5V resp. 3,3V, Rx - Tx , Tx - Rx
BOOT0 jumper on 3,3V, (caution, on some boards BOOT0 is labeled wrongly as BOOT1, see images for position), reset

```
./stm32flash -v -w /path/firmware.bin /dev/ttyUSB0
```

BOOT0 back to ground, reset, reconnect USB (or USB jumper off, on)

flash firmware via USB (STM32F105):
BOOT0 jumper on 3,3V, reset, reconnect USB (or USB low shortly)

```
./dfu-util -a 0 -s 0x8000000 -D /path/firmware.bin
```

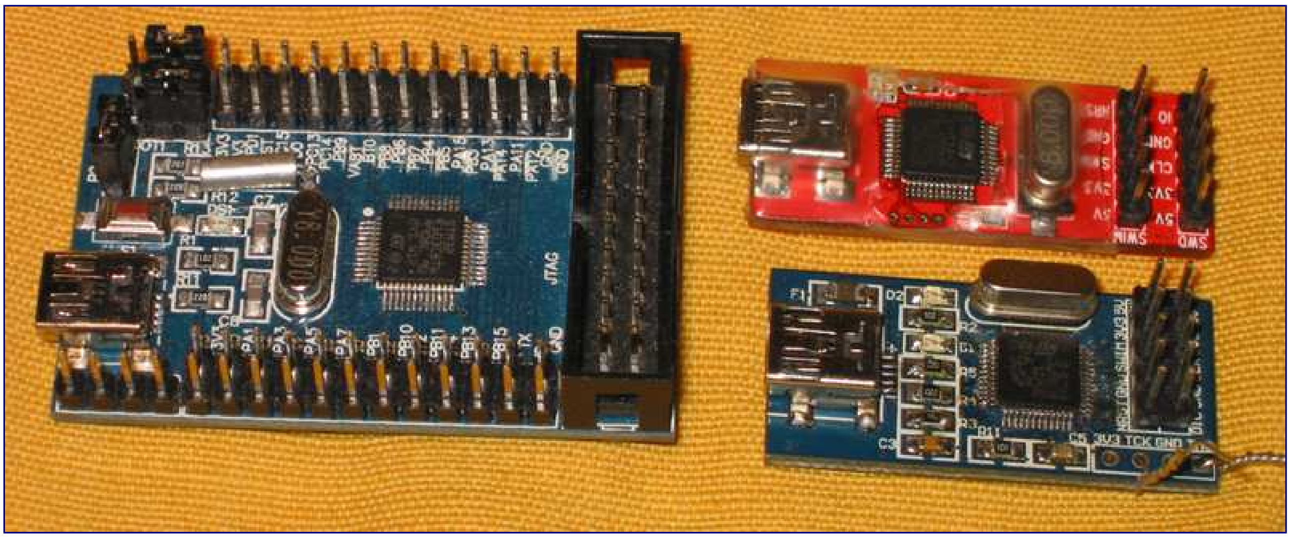
BOOT0 back to ground, reset, reconnect USB (or USB low shortly)

flash firmware via ST-Link:
SWDIO -> PA13, SWCLK -> PA14, Gnd - Gnd, 3,3V - 3,3V

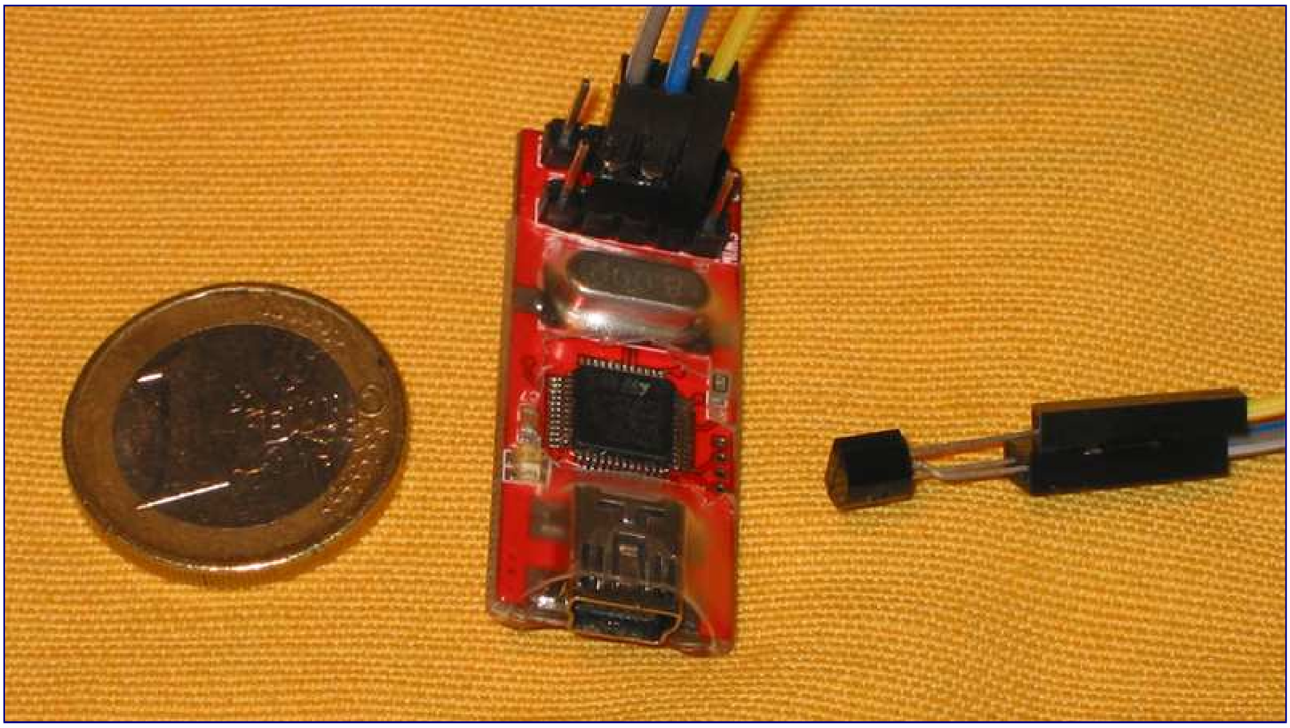
Other STM32 Microcontrollers

- the STM32F105 firmware is easily customizable to STM32F107, STM32F2xx and STM32F4xx, as the same USB library is used
- the STM32F103 firmware is easily customizable to STM32L1xx and STM32F3xx, as the same USB library is used

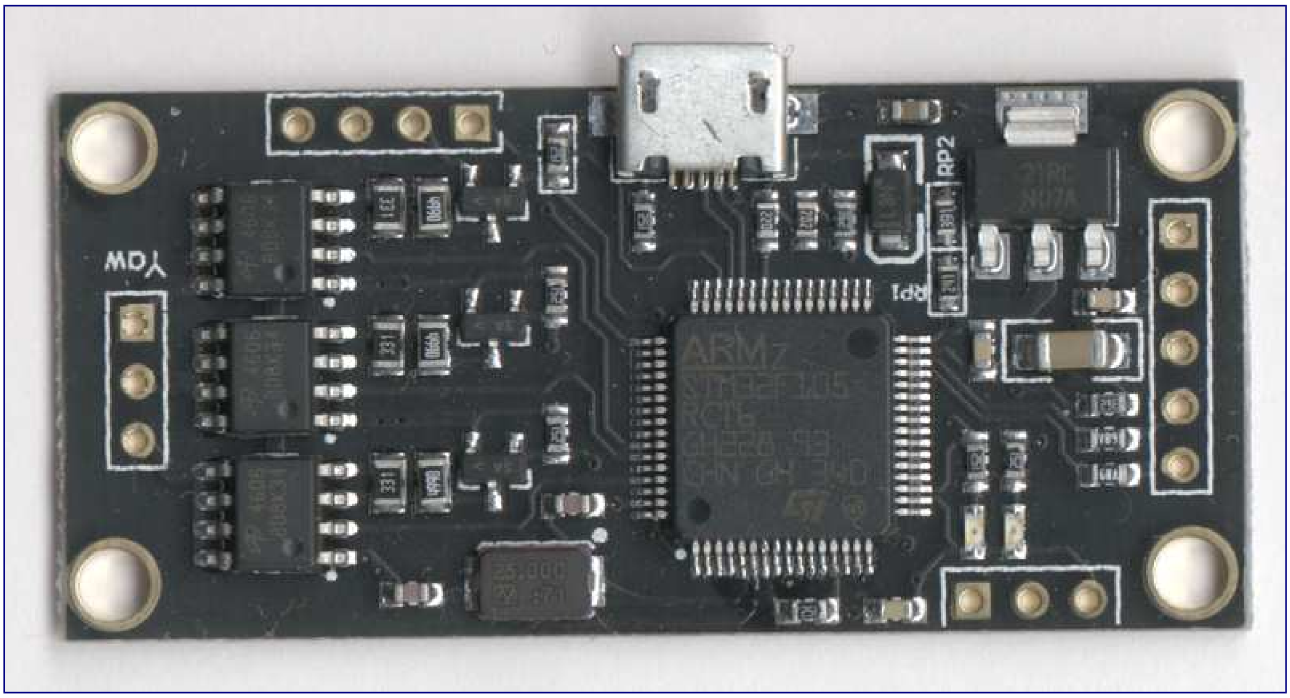
Images



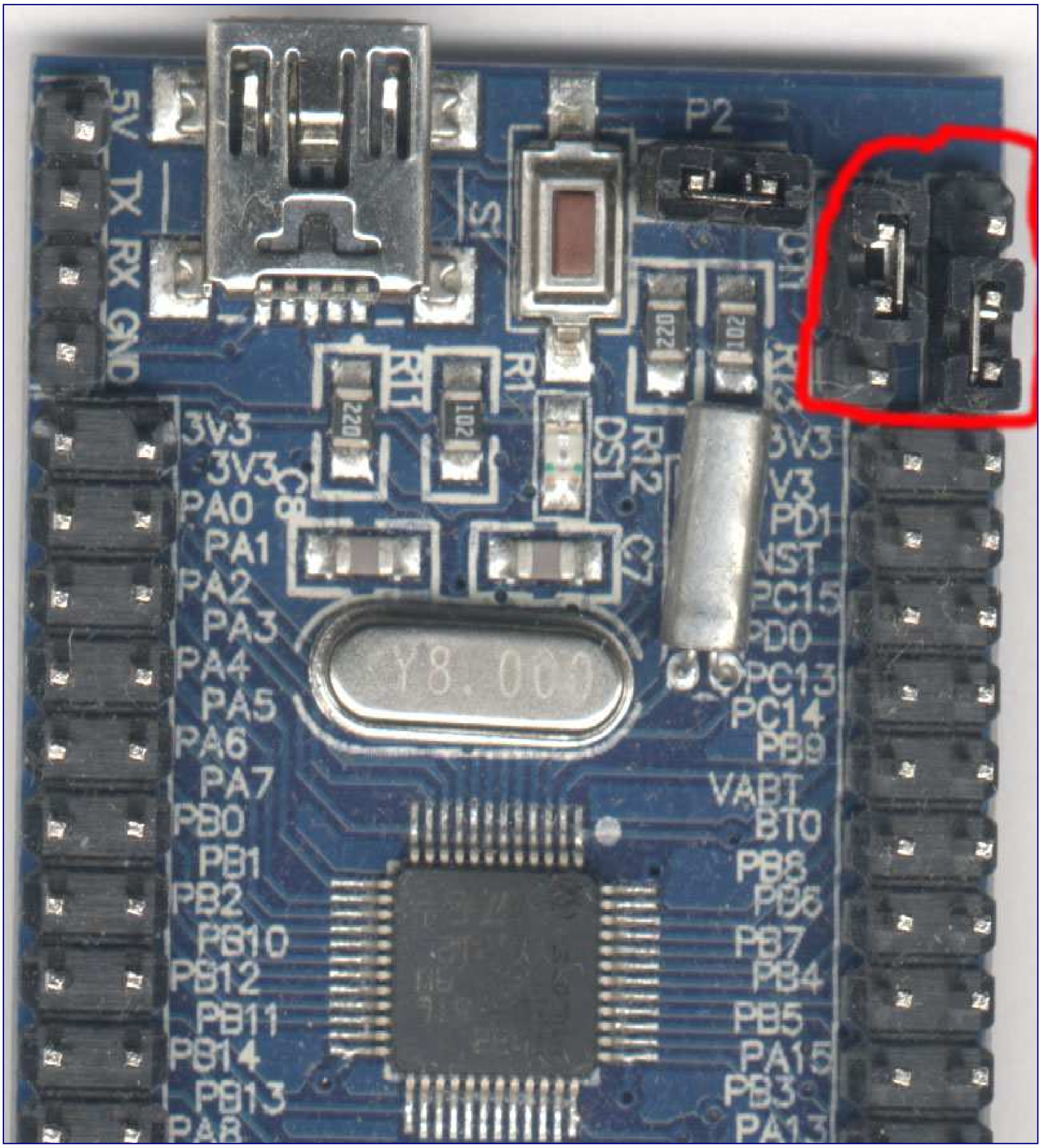
On the STM32F103C8T6 developer board BOOT0 and BOOT1 labels are exchanged. On the red ST-Link emulator the plastic is cut open some. On the blue ST-Link emulator CLK and TCK are exchanged and DIO und TMS as well.



Attached to the red a TSOP „dummy“ and 1 € for size comparison.
On the St-Links it might be necessary to remove the pullup resistor (red) or the pulldown resistor (blue) on SWIM. Or use a function, which is not disturbed by them.



With this STM32F105 board, intended as camera gimbal controller, the development started.



Jumper position for flashing via Tx/Rx (also if labeled incorrectly)

Thanks to

Frank Meyer for IRMP und IRSND. [1]
Uwe Becker for adapting IRMP and IRSND to the STM32F4xx
and his USB-HID for the STM32F4xx. [2]
His work helped me in getting started with the STM32F105.
Andrew Kambaroff for his USB-HID for the STM32F103. [3]
His work helped me in getting started with the STM32F103.
Ole Ernst for code review, linux Makefile and linux download-extract-patch-script, much better

macro implementation and new protocol. [4]
Manuel Reimer for gcc-4.9 fix, SimpleCircuit and check if host running. [5]

[1] https://www.mikrocontroller.net/articles/IRMP
[2] http://mikrocontroller.bplaced.net/wordpress/?page_id=744
[3] http://sysmagazine.com/posts/208026/
[4] https://github.com/olebowle
[5] https://github.com/M-Reimer

Discussion

Express opinions, suggestions for improvement, criticism and similar at https://www.vdr-portal.de/forum/index.php?thread/123572-irmp-auf-stm32-ein-usb-ir-empf%C3%A4nger-sender-einschalter-mit-wakeup-timer/ .
https://www.mikrocontroller.net/topic/347290 seems to be fallen asleep.

Construction manual

NEW: https://www.mikrocontroller.net/articles/IRMP_auf_STM32_%E2%80%93_stark_vereinfachte_Bauanleitung
https://www.mikrocontroller.net/articles/IRMP_auf_STM32_-_Bauanleitung

Much fun with IRMP on STM32!