

CK-USB-04A

IQRF Programmer and Debugger

HW v1.00, FW v1.01

User's Guide



Description

CK-USB-04A is a development kit intended for programming and debugging of user applications with IQRF transceiver modules.

It can serve also as an IQRF USB gateway (USB ↔ SPI converter) or just a simple host for TR module application.



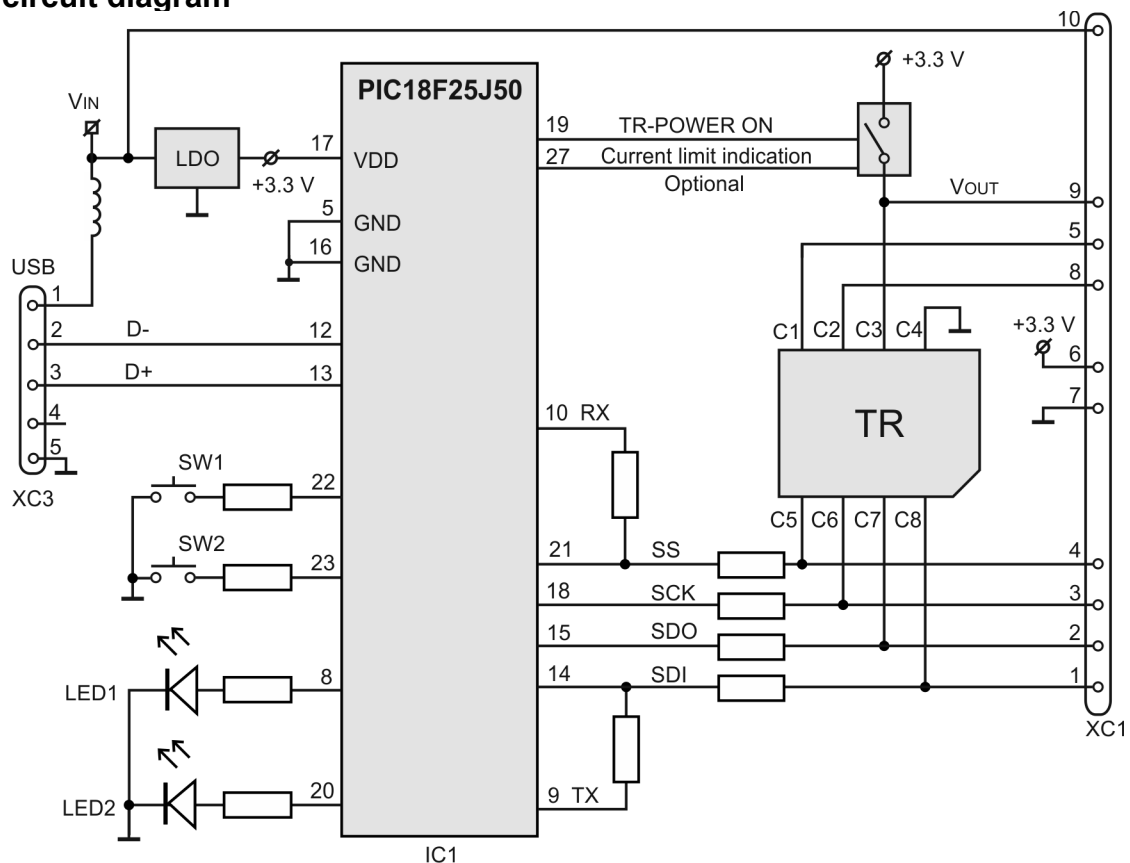
Applications

- Programmer for IQRF transceiver modules
- In-circuit programming supported
- IQRF debugging kit
- End IQRF application host
- USB gateway
- USB to SPI converter
- PC connectivity

Key features

- Supported by the IQRF IDE development environment
- Wired or wireless (RFPGM) upload possible
- SIM connector with plastic holder for TR module
- 2 pushbuttons, 2 LEDs
- USB interface (CDC and Custom device, MICRORISC VID & PID)
- I/O, power supply and upload interface via single row connector
- Powered via USB connector
- V_{OUT} controlled by IQRF IDE, optionally current-limited
- Multiple devices controlled by IQRF IDE on single PC
- Firmware upgradeable from IQRF IDE

Simplified circuit diagram



Electrical specifications

Power supply input (V_{IN})	
Supplied from USB	5.0 V
Supplied via external power connector XC1	3.6 V – 5 V. USB must be disconnected in this case.
Power supply output (V_{OUT})	3.3 V, with optional current limitation
I/O and SPI voltage levels	3.3 V
Operating temperature	0 °C to +70 °C -40 °C to +85 °C (Industrial) available on request
Size	48 mm x 27 mm x 11 mm
Weight	10 g

Absolute maximum ratings

Stresses above those values may cause permanent damage to the device. Exposure to maximum rating conditions for extended periods may affect device reliability.

Supply voltage:	5.5 V
Storage temperature:	-40 °C to +85 °C

Control and indication

Pushbuttons

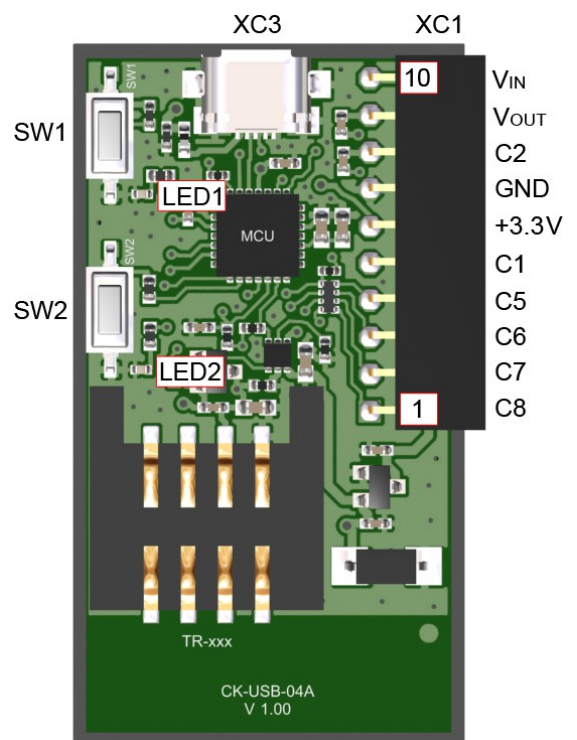
- SW1 – C5 pin control: pushed => C5 = log. 0. During SPI communication this pushbutton is ignored.
- SW2 – V_{OUT} (TR module power) off (useful for TR reset and restart the application program)

LEDs

- Both LEDs flash once after power on.
- LED1 flashing in 1 s period means CDC mode (Custom Device mode is without flashing).
- LED2 flashes once after TR reset induced by IQRF IDE or pushbutton SW2.
- LED1 flashes 3x after the *Indicate USB Device* command (key *F11*) in respective IQRF IDE (to identify the kit in case of multiple IQRF USB devices or IDE instances).
- Complementary LED1 and LED2 flashing in ~1 s period means missing firmware (see *Firmware upgrade* below).
- While a pushbutton is pressed the appropriate LED is on.

Connectors

- USB: Micro USB
- SIM: Supported TR types see table *Compatibility* below.
- XC1: I/O / SPI / programming / power interface. Female connector for square 0.635 mm, 2.54 mm pitch pins.



Caution: The TR module can be plugged / unplugged into / from the SIM connector while powered off only.

Tip: Use the SW2 pushbutton for this. The TR module is not powered while the SW2 pushbutton is held.

USB

The device supports two USB modes:

- Custom Device mode
Full communication with the IQRF IDE is enabled in this mode.
- CDC mode
After connecting to PC a virtual serial port is created in this mode. The user can create his own PC program and communicate via this port using the protocol described in document *CDC implementation in IQRF platform*.

Switching between the modes:

- Using IQRF IDE 4:
 - From Custom Device to CDC: Tools → USB Classes → Switch to CDC mode.
 - From CDC to Custom Device: Tools → USB Classes → Switch to Custom Device mode.
- Using the *Switch to USB Custom Class* command in CDC protocol.

Current mode indication see chapter LED. The last selected mode is restored after start-up or reset.

Tip

For testing a communication in CDC mode various SW terminals operating with PC serial ports are available. Select a terminal enabling to issue direct byte commands and data. Refer to the communication protocol described in CDC Implementation in IQRF USB devices User's guide.

Recommended terminal: Docklight, www.docklight.de. There is a project containing all supported commands for this terminal available at www.iqrf.org/218. It is necessary just to select the COM port used.

Unsuitable terminal: Windows Hyperterminal and Tera Term.

Application

Installing

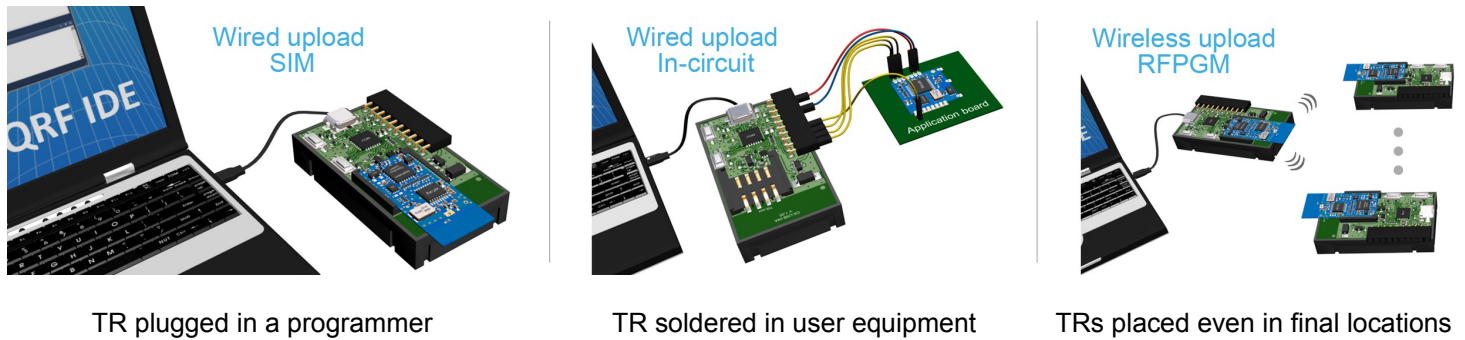
See the IQRF Quick Start guide, IQRF IDE Help and IQRF application examples (www.iqrf.org/examples).

Upload

CK-USB-04A enables to upload an application code into IQRF TR modules in following ways:

- Wired upload
 - TR module plugged in the SIM connector – see the IQRF Quick Start guide.
 - TR module assembled in user equipment (in-circuit upload via connector XC1), see below.
- Wireless upload (RFPGM – RF Programming™) – see IQRF OS User's guide (Appendix RFPGM) and IQRF IDE (*Programming* → *RF programmer*).

Supported TR types see table *Compatibility* below.



TR plugged in a programmer

TR soldered in user equipment

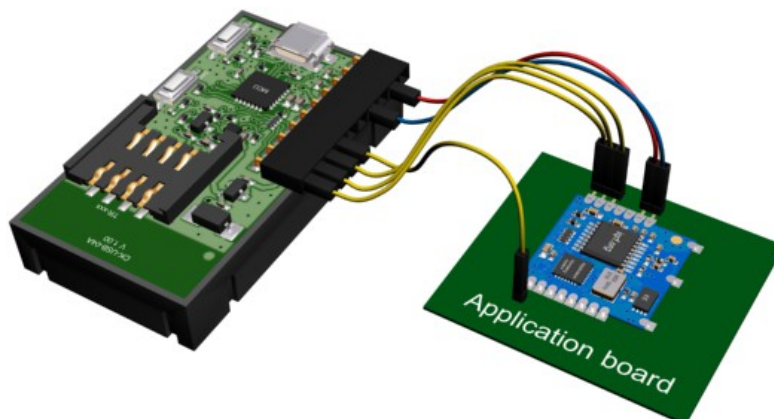
TRs placed even in final locations

In-circuit upload

CK-USB-04A enables to upload an application code also into IQRF TR modules assembled in end user equipment. This allows to manufacture boards with soldered unprogrammed TRs and then upload the code just before shipping the product (to deliver the most recent SW version or a custom modification) or even upgrade the code with a new SW version later on.

6-wire programming interface (GND, power supply line and 4-wire SPI) is accessible on the XC1 connector. Pin connection for individual TR modules:

	C5	C6	C7	C8	C4	C3
	-SS	SCK	SDI	SDO	GND	Vout
TR-52D	C5	C6	C7	C8	C4	C3
TR-54D	Q11	Q6	Q7	Q8	Q2	Q3
TR-55D	Q3	Q6	Q5	Q4	Q7	Q1
TR-56D	Q9	Q6	Q7	Q8	Q2	Q3

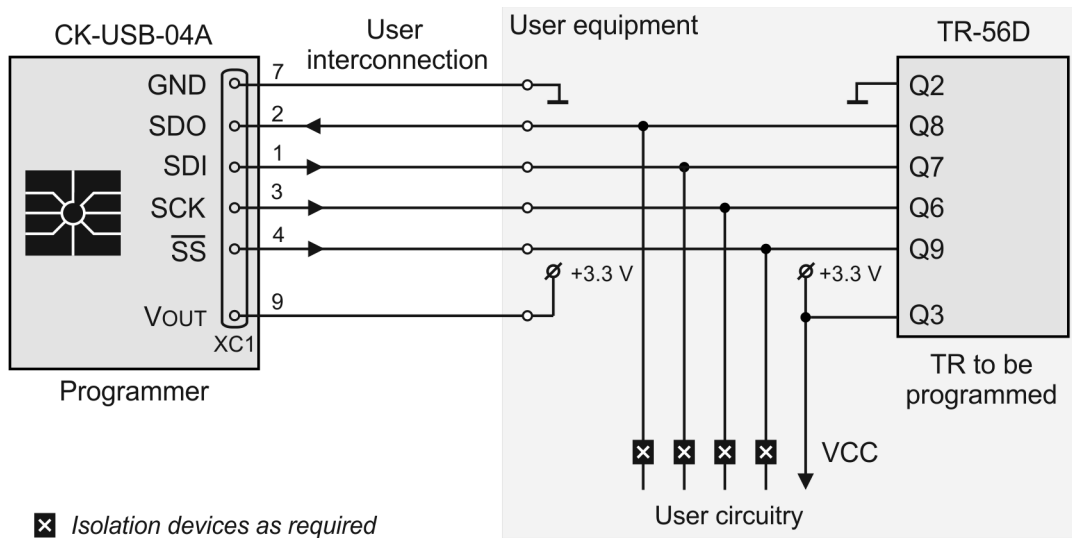


SPI lines must be isolated from other circuitry to avoid influencing on levels by the user equipment. Isolation devices are highly dependent on the specific application and may include devices such as resistors, diodes, or even jumpers. High impedance output can also be considered as a suitable isolation.

There are two typical ways of connection regarding power supply. The following diagrams show examples for TR-56D. For other TR types refer to table *Pin compatibility* above.

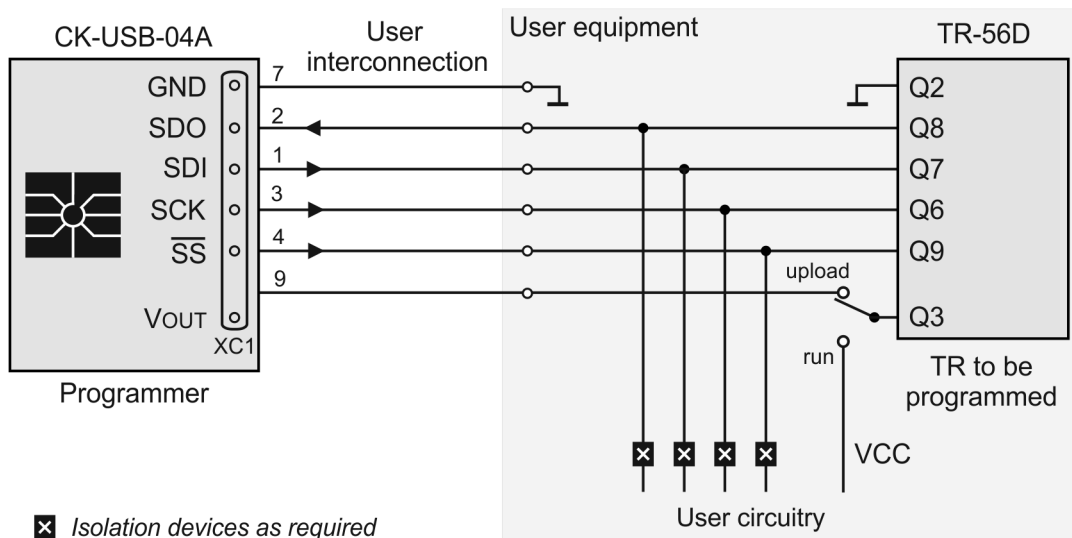
1. Application supplied from the programmer during upload

User applications with **3.3 V** supply voltage, consuming **100 mA max.** can be supplied from the programmer. Target equipment must have its own power source turned off during upload.



2. Application supplied from its own power source during upload

For user equipment consuming more than 100 mA just the TR module must be supplied from the programmer. Thus, independent power source supplying the rest of the equipment must be separated during upload.



Interconnection between CK-USB-04A and TR module

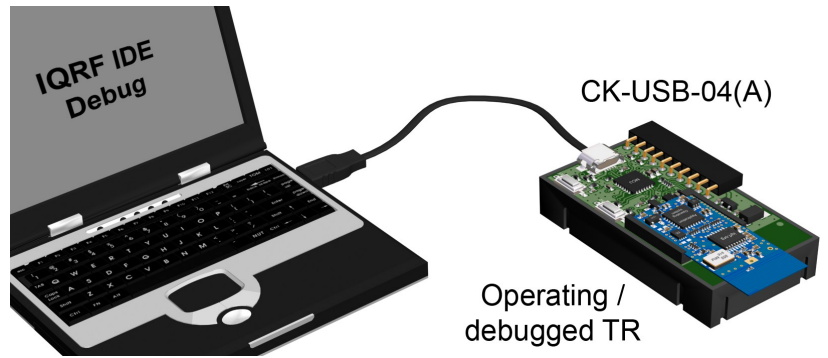
No interconnection cable between the adapter (via connector XC1) and user application is provided. The user should create a connection according to specific application. **Max. 10 cm cable length is allowed.**

For TR modules with RJ-45 connector, e.g. TR-58D-RJ, special interconnecting kit KON-RJ-01 is intended.

Programming adapter KON-TR-01P intended for in-circuit upload using CK-USB-04 can also be used with CK-USB-04A.

Debug

See the IQRF Quick Start guide, IQRF IDE Help and IQRF application example E06-RAM (www.iqrf.org/examples).



Compatibility

Supported TR module types, upload methods and corresponding interconnection:

	Plugged in SIM	In-circuit	RFPGM
TR-52D	Yes	XC1	Yes
TR-54D	–	XC1	Yes
TR-55D	Yes	XC1	Yes
TR-56D	Yes	XC1	Yes
TR-58D-RJ	–	KON-RJ-01	Yes
TR-52B	Yes	XC1	Yes
TR-53B	–	XC1	Yes

Firmware upgrade

CK-USB-04A firmware can be upgraded by the user with new versions possibly released by the IQRF manufacturer using the IQRF IDE 4.14 or higher, menu *USB Device* → *USB Device Manager* → *Update FW*. See IQRF IDE Help.

Product information

Pack list

- CK-USB-04A IQRF programmer & debugger (without a TR-module and interconnection cables).
V_{OUT} current limitation not implemented.

Recommended options

- CAB-USBABMICRO Standard microUSB communication cable (USB A ↔ micro USB)
- KON-RJ-01 Interconnecting kit to upload TR modules with RJ-45 connector, e.g. TR-58DA-RJ

Ordering code

- CK-USB-04A IQRF development kit

Document history

- 140120 Revised, updated for new TR modules and IQRF IDE. Document file renamed from MNCKUSB04A_131121 to User_Guide_CK-USB-04A_140120.
- 131121 First release

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