

FT232H USB2JTAG

前言

概述

本文主要介绍 Rockchip FT232H USB 转 JTAG 小板的使用

产品版本

芯片名称	内核版本
all	

读者对象

本文档（本指南）主要适用于以下工程师：

技术支持工程师

软件开发工程师

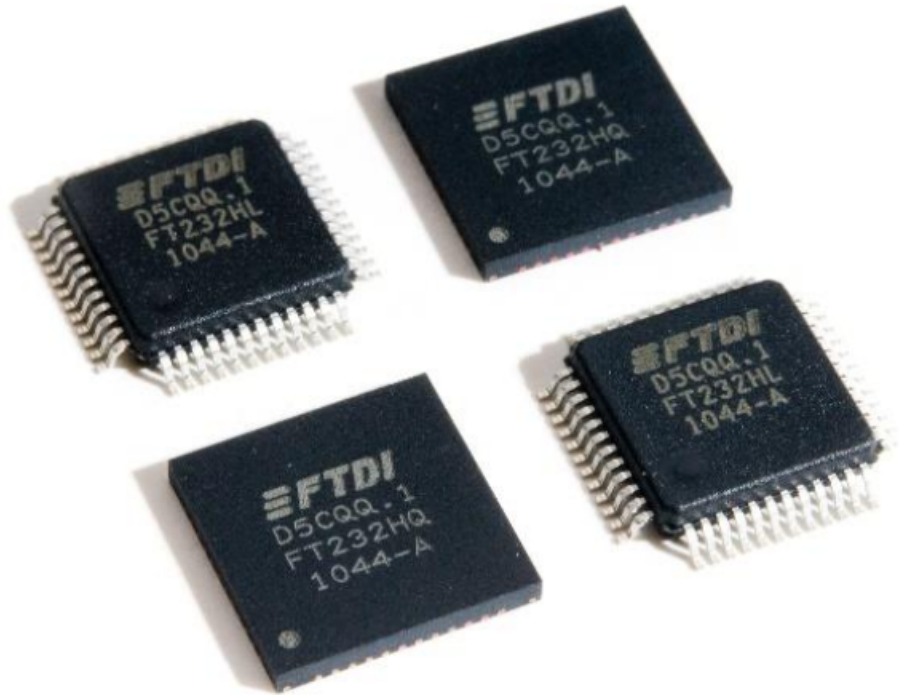
目录

FT232H USB2JTAG

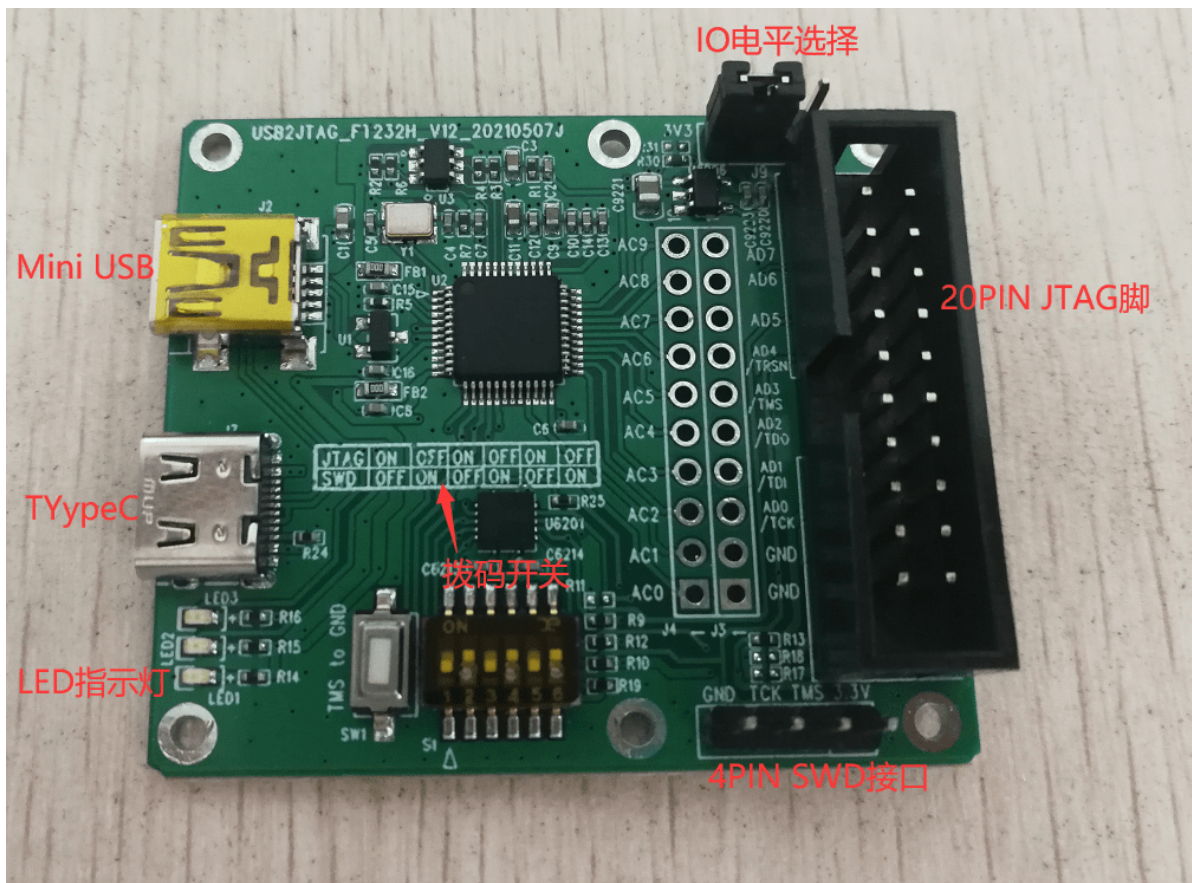
1. FT232H芯片
2. Rockchip FT232H 小板
3. 驱动安装
 - 3.1 Windows 驱动替换
 - 3.1.1 运行 RK\tools\zadig-2.5.exe
 - 3.1.2 将 FT232H 默认驱动改为 WinUSB 驱动
 - 3.1.3 安装成功
 - 3.1.4 用openocd测试驱动是否安装成功
4. Windows 环境下配置 FT232H EEPROM 信息（可选）
 - 4.1 安装 EEPROM 编程工具 FT_Prog_v3.8.128.448 Installer.exe
 - 4.2 运行 FT_Prog.exe
 - 4.3 配置驱动属性
 - 4.4 配置 JTAG/SWD 驱动强度
 - 4.5 开始编程
5. Windows上Jlink适用OpenOCD

1. FT232H芯片

FT232H 是“Future Technology Devices International Ltd”的一款芯片，USB 转各种接口，这里主要使用 USB 转 JTAG/SWD 功能。



2. Rockchip FT232H 小板



FT232H 小板：

- LED 指示灯，LED1：电源指示灯；LED2：灭：未连接，闪：连接；LED3：暂时未定义；
- USB 接口：有 TYPEC 接口和 mini USB 接口两种
- ARM 20PIN JTAG 接口
- 拨码开关
 - SWD 模式，1、3、5 off，2、4、6 on
 - JTAG 模式，1、3、5 on，2、4、6 off
- 排针，VCC、TCS、TCK、GND，可以和板子飞线连接
- 排针，3.3V、VCCIO、1.8V，可以用跳冒连接VCCIO到3.3V或1.8V，这个一定要接，不然JTAG通讯会失败

3. 驱动安装

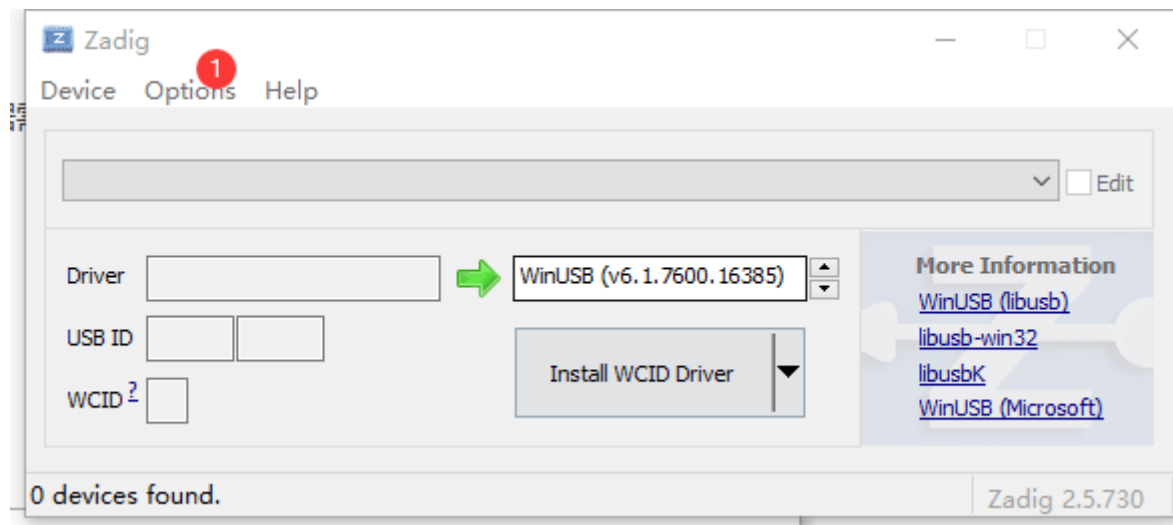
3.1 Windows 驱动替换

不同的软件在使用 FT232H 时，驱动是不一样的，那么就需要根据需求来修改 FT232H 的 USB 驱动。

以下以 OpenOCD 使用 FT232H 为例：

3.1.1 运行 RK\tools\zadig-2.5.exe

点击Options, 选择List All Devices



3.1.2 将 FT232H 默认驱动改为 WinUSB 驱动

1 选择Single RS232-HS这个设备

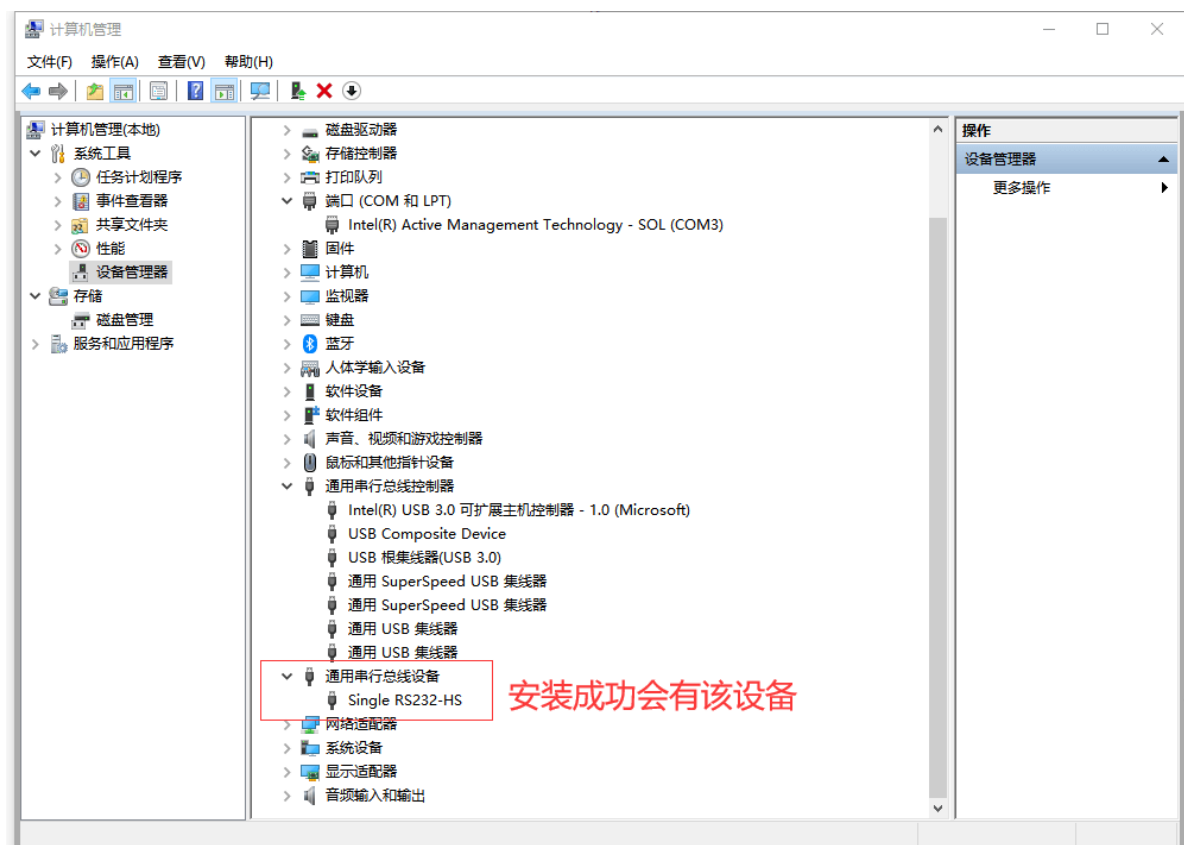
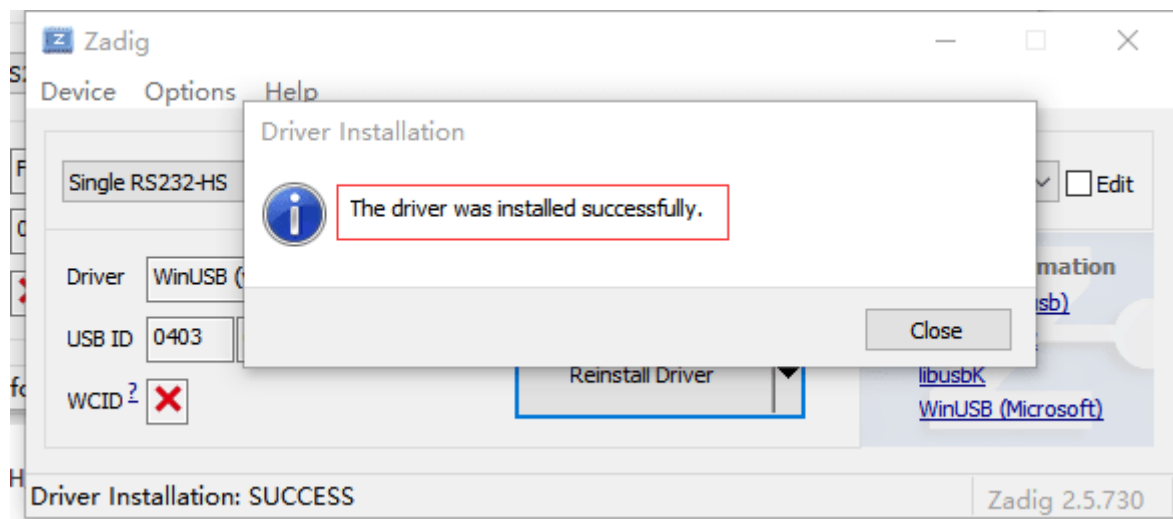
3 确认USB ID是0403 6014

4 选择WinUSB驱动

5 安装驱动



3.1.3 安装成功



3.1.4 用openocd测试驱动是否安装成功

```
选择命令提示符
C:\Users\hbb>F:\software\OPENOCD\Windows环境\openocd_eclipse\RK\OpenOCD\bin\openocd.exe -r rk3568
Open On-Chip Debugger 0.10.0+dev-01525-g642e7fbbc-dirty (2021-05-25-15:44)
Licensed under GNU GPL v2
For bug reports, read
  http://openocd.org/doc/doxygen/bugs.html
Info : Please follow steps below:
Info : step1: run (./openocd -r rk3399) to connect the target board
Info : step2: run (telnet localhost 4444) to enter command mode
Info : step3: telnet command mode, use the command below:
Info : (1) list the targets support
Info : (1 cpu0) set cpu0 as current target
Info : (pcsr) dump the pc of cpu when cpu is running
Info : (io) io -4 [-r(w)] [-l size] addr [write val]
Info : (halt) stop cpu
Info : (resume) resume cpu
Info : (step) step cpu
Info : (mdw) read memory in 4 bytes
Info : (mww) write memory in 4 bytes
Info : (smdw) secure read memory in 4 bytes
Info : (smww) secure write memory in 4 bytes
Info : (reg [x0]) display cpu reg
Info : (bp -h) add breakpoint
Info : (rbp -h) remove breakpoint
Info : (wp -h) remove watchpoint
Info : (rwp -h) remove watchpoint
Info : (asm pc [count ['thumb']]) disassemble
Info : (msr TCR_EL1 0x55aa55aa) write cpu system control register
Info : (mrs TCR_EL1) read cpu system control register
Info : load_image filename address ['bin'|'ihex'|'elf'|'s19'] [min_address] [max_length]
Info : verify_image filename [offset [type]]
Info : dump_image filename address size
Info : (help) list all openocd commands
Error: no usb device, please plug in ft232, ft2232 or jlink
Error: Debug adapter doesn't support any transports?
.openocd/rk3568.cfg:24: Error:
in procedure 'script'
at file "embedded:startup.tcl", line 26
at file ".openocd/rk3568.cfg", line 24

C:\Users\hbb>
```

执行该命令，-r 后面加芯片名字

表示没插入JTAG适配器

```
选择命令提示符
C:\Users\hbb>
C:\Users\hbb>F:\software\OPENOCD\Windows环境\openocd_eclipse\RK\OpenOCD\bin\openocd.exe -r rk3568
Open On-Chip Debugger 0.10.0+dev-01525-g642e7fbbc-dirty (2021-05-25-15:44)
Licensed under GNU GPL v2
For bug reports, read
  http://openocd.org/doc/doxygen/bugs.html
Info : Please follow steps below:
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Info : (smdw) secure read memory in 4 bytes
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Info : (rbp -h) remove breakpoint
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Info : (rwp -h) remove watchpoint
Info : (asm pc [count ['thumb']]) disassemble
Info : (msr TCR_EL1 0x55aa55aa) write cpu system control register
Info : (mrs TCR_EL1) read cpu system control register
Info : load_image filename address ['bin'|'ihex'|'elf'|'s19'] [min_address] [max_length]
Info : verify_image filename [offset [type]]
Info : dump_image filename address size
Info : (help) list all openocd commands
adapter speed: 2000 kHz

Info : FTDI SWD mode enabled
Info : Hardware thread awareness created
force hard breakpoints
Info : Listening on port 6666 for tcl connections
Info : Listening on port 4444 for telnet connections
Error: libusb_open() failed with LIBUSB_ERROR_NOT_SUPPORTED
Error: no device found
Error: unable to open ftdi device with vid 0403, pid 6014, description '*', serial '*' at bus location '*'

C:\Users\hbb>
```

执行该命令

表示认到FT232H适配器，但驱动不对


```
命令提示符 - F:\software\OPENOCD\Windows环境\openocd_eclipse\RK\OpenOCD\bin\openocd.exe -r rk3568
C:\Users\hnb>F:\software\OPENOCD\Windows环境\openocd_eclipse\RK\OpenOCD\bin\openocd.exe -r rk3568
Open On-Chip Debugger 0.10.0+dev-01525-g642e7fbbc dirty (2021-05-25 15:44)
Licensed under GNU GPL v2
For bug reports, read
    http://openocd.org/doc/doxygen/bugs.html
Info : Please follow steps below:
Info : step1: run (./openocd -r rk3399) to connect the target board
Info : step2: run (telnet localhost 4444) to enter command mode
Info : step3: telnet command mode, use the command below:
Info : (l) list the targets support
Info : (l cpu0) set cpu0 as current target
Info : (pcsr) dump the pc of cpu when cpu is running
Info : (io) io -4 [-r(w)] [-l size] addr [write val]
Info : (halt) stop cpu
Info : (resume) resume cpu
Info : (step) step cpu
Info : (mdw) read memory in 4 bytes
Info : (mww) write memory in 4 bytes
Info : (smdw) secure read memory in 4 bytes
Info : (smww) secure write memory in 4 bytes
Info : (reg [x0]) display cpu reg
Info : (bp -h) add breakpoint
Info : (rbp -h) remove breakpoint
Info : (wp -h) remove watchpoint
Info : (rwp -h) remove watchpoint
Info : (asm pc [count ['thumb']]) disassemble
Info : (msr TCR_EL1 0x55aa55aa) write cpu system control register
Info : (mrs TCR_EL1) read cpu system control register
Info : load_image filename address ['bin'|'ihex'|'elf'|'s19'] [min_address] [max_length]
Info : verify_image filename [offset [type]]
Info : dump_image filename address size
Info : (help) list all openocd commands
adapter speed: 2000 kHz

Info : FTDI SWD mode enabled
Info : Hardware thread awareness created
force hard breakpoints
Info : Listening on port 6666 for tcl connections
Info : Listening on port 4444 for telnet connections
Info : clock speed 2000 kHz
Info : SWD DPIDR 0x2ba01477
Info : cpu0: hardware has 6 breakpoints, 4 watchpoints
Info : cpu1: hardware has 6 breakpoints, 4 watchpoints
Info : cpu2: hardware has 6 breakpoints, 4 watchpoints
Info : cpu3: hardware has 6 breakpoints, 4 watchpoints
Info : starting gdb server for cpu0 on 3333
Info : Listening on port 3333 for gdb connections
Info : starting gdb server for cpu1 on 3334
```

认到芯片，表示连接成功

说明：安装时，请保持设备插入状态，如果安装成功后无法使用，请重新拔插。

注意：安装完WinUSB驱动后，想要用FT_Prog.exe来配置的话，需要在设备管理器里将该设备的驱动卸载。

4. Windows 环境下配置 FT232H EEPROM 信息（可选）

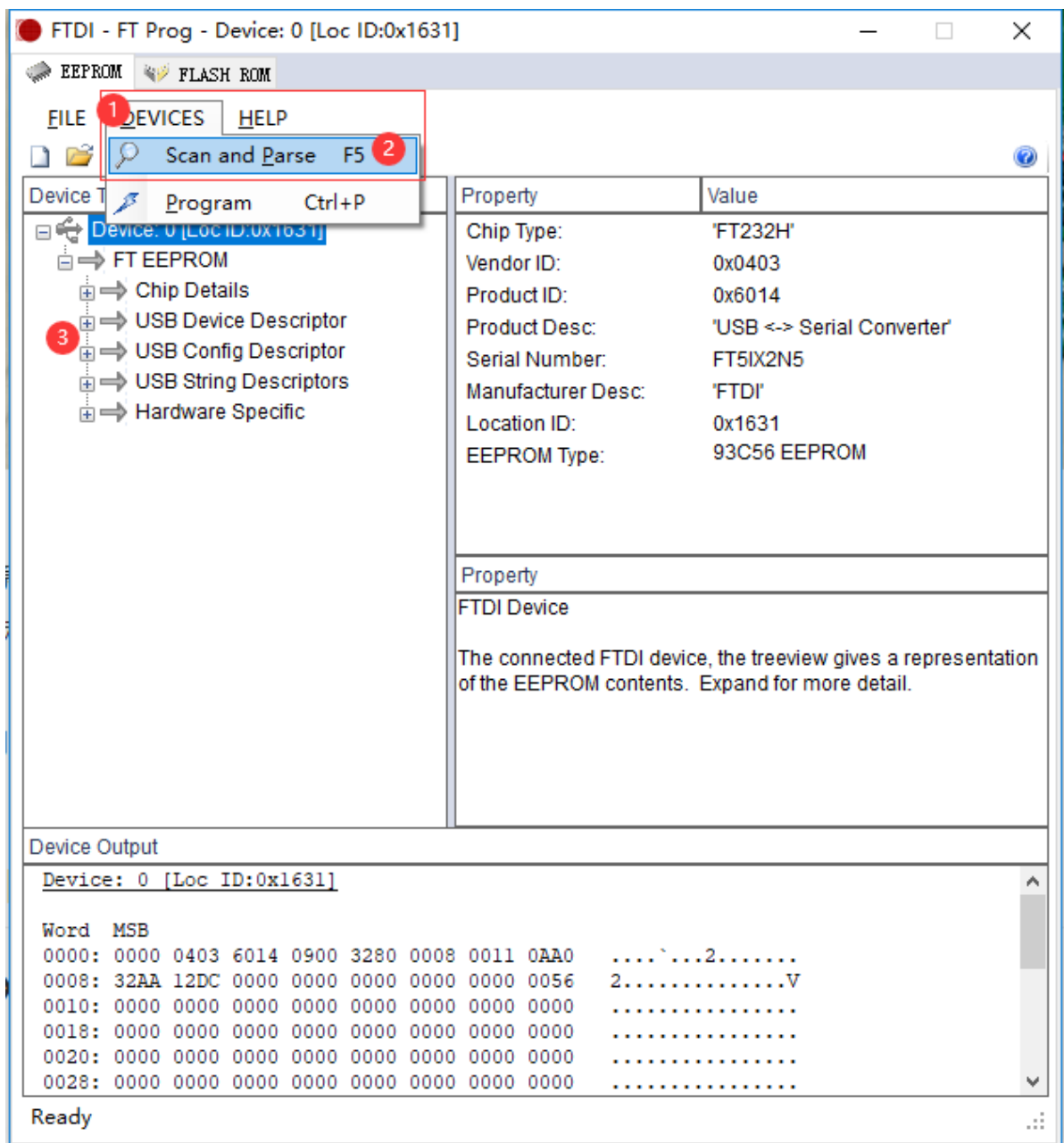
4.1 安装 EEPROM 编程工具 FT_Prog_v3.8.128.448 Installer.exe

解压 openocd_eclipse.zip，安装 RK\tools\FTDI\FT_Prog_v3.8.128.448 Installer.exe

或者网络下载：

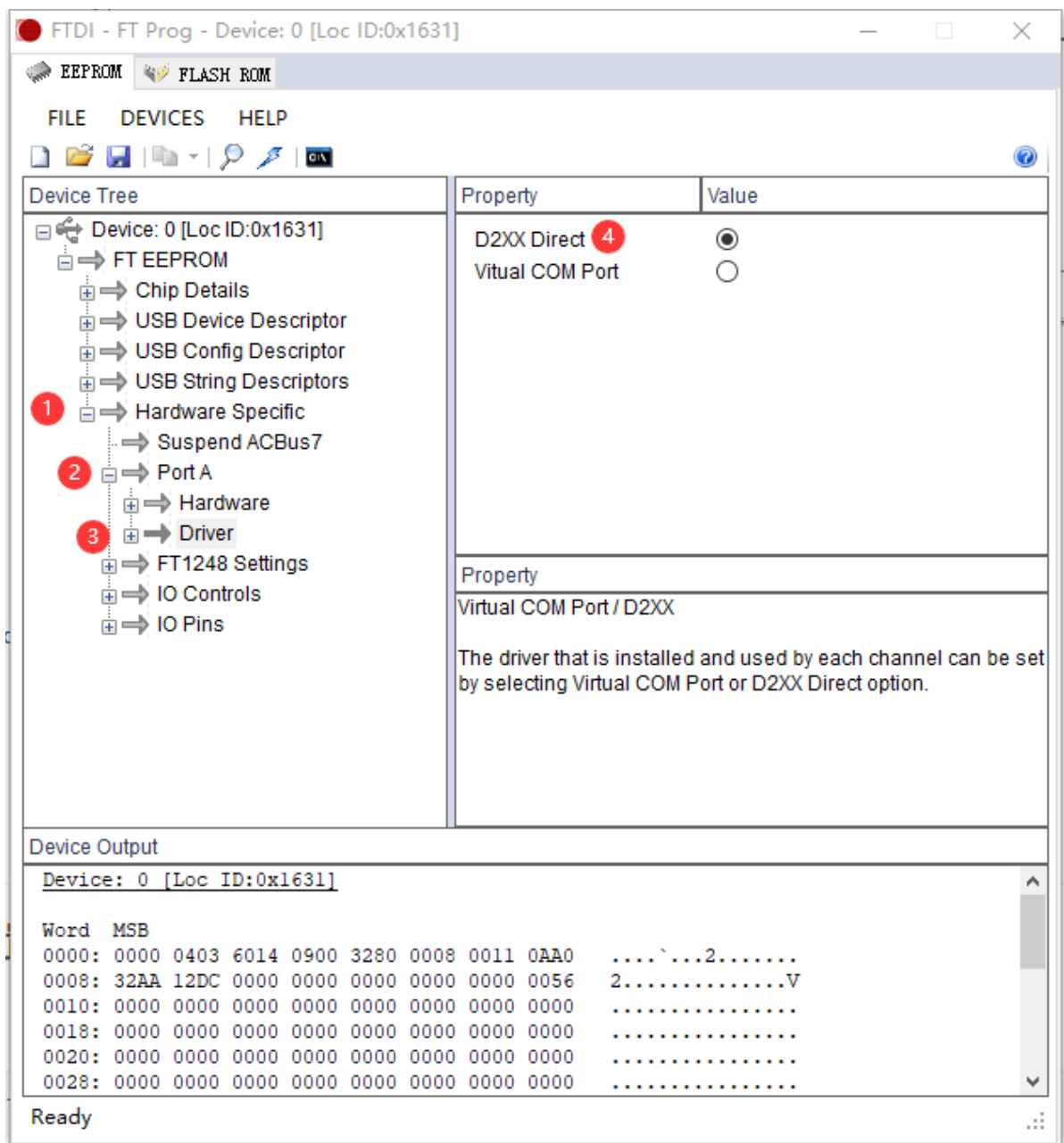
https://www.ftdichip.com/Support/Utilities.htm#FT_PROG

4.2 运行 FT_Prog.exe



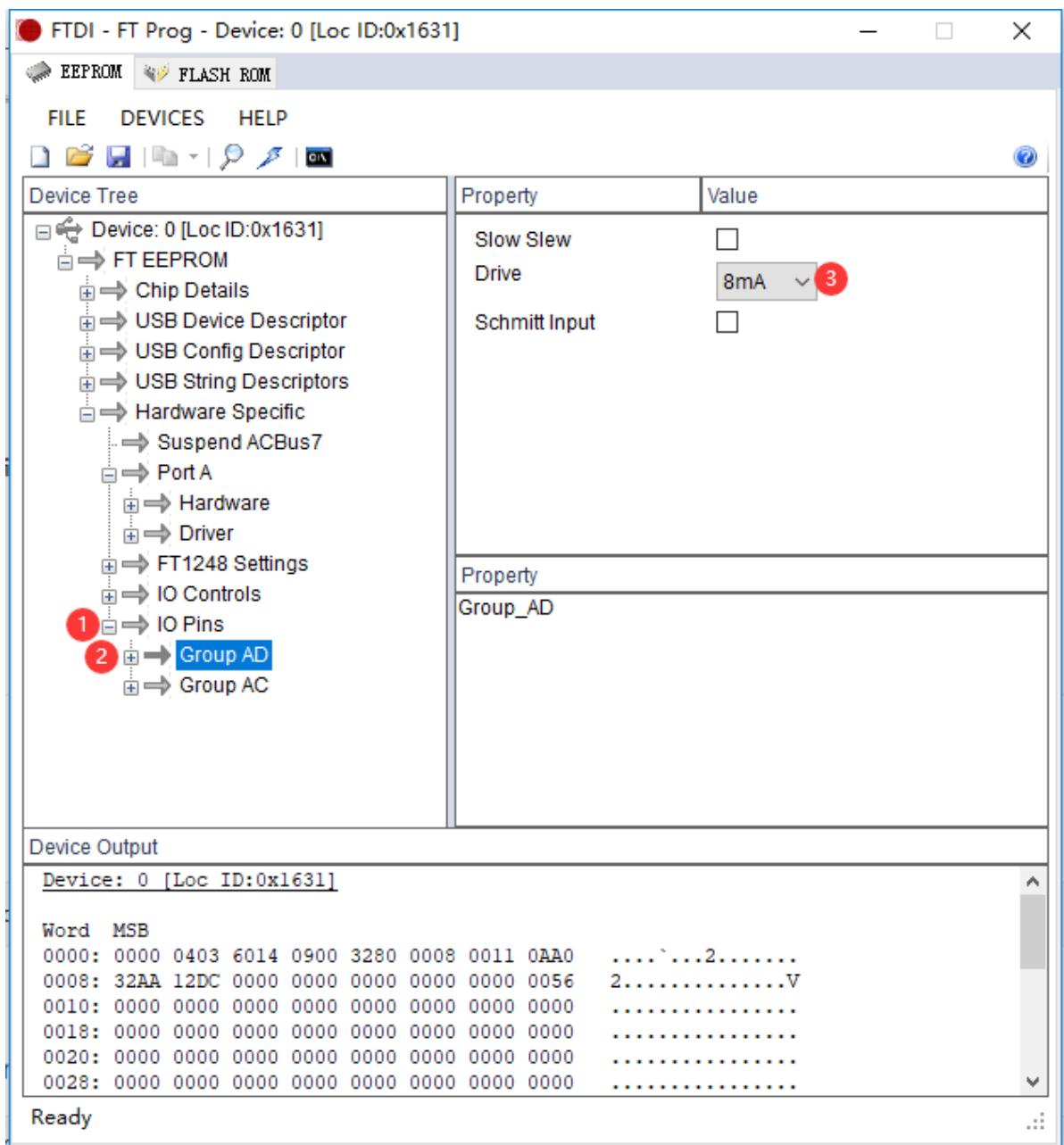
- 1 点击 DEVICES 菜单
- 2 扫描设备
- 3 扫描结果

4.3 配置驱动属性



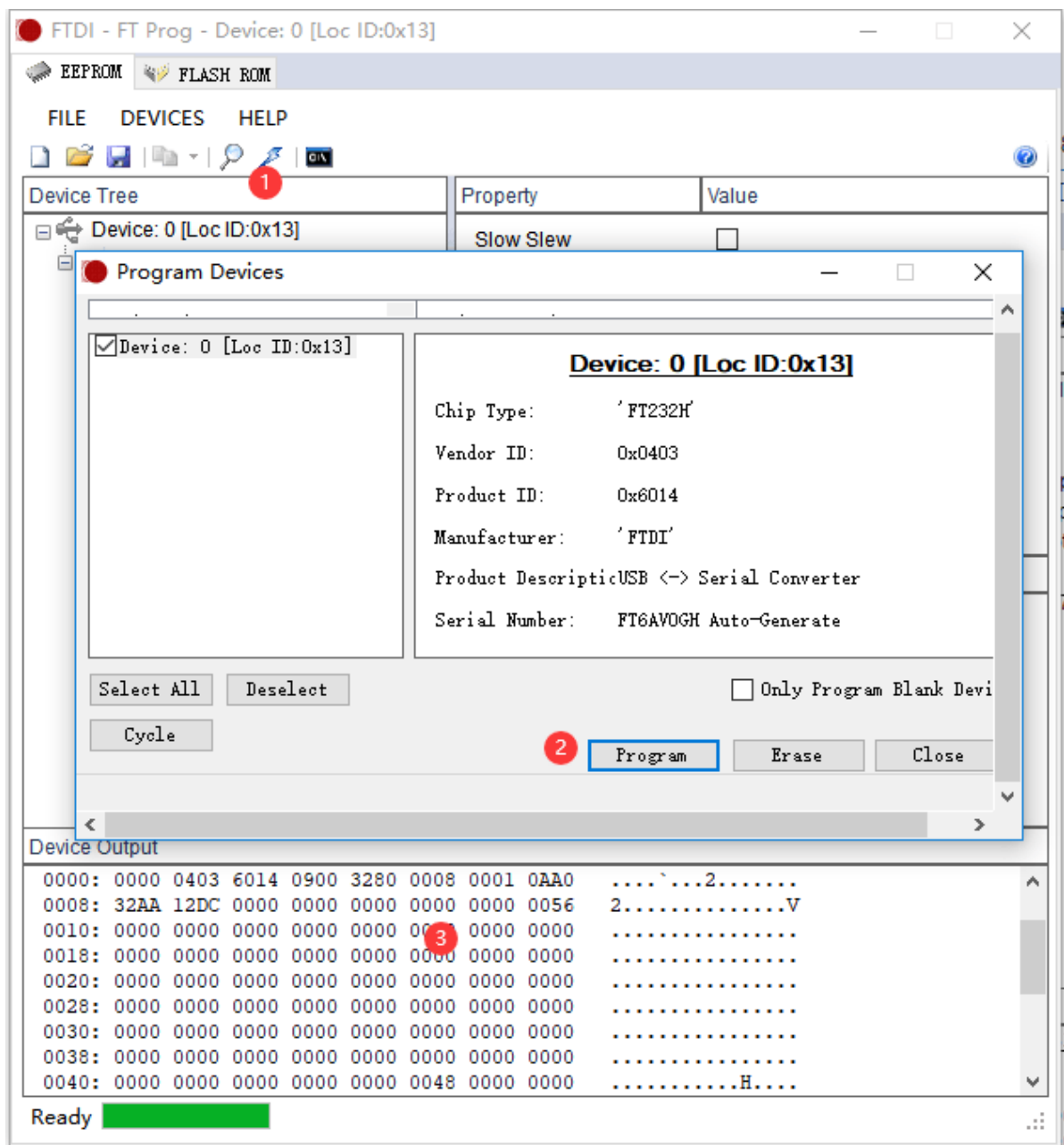
- 1 点击并打开 Hardware Specific
- 2 点击并打开 Port A
- 3 选中 Driver
- 4 选择 D2XX Direct

4.4 配置 JTAG/SWD 驱动强度



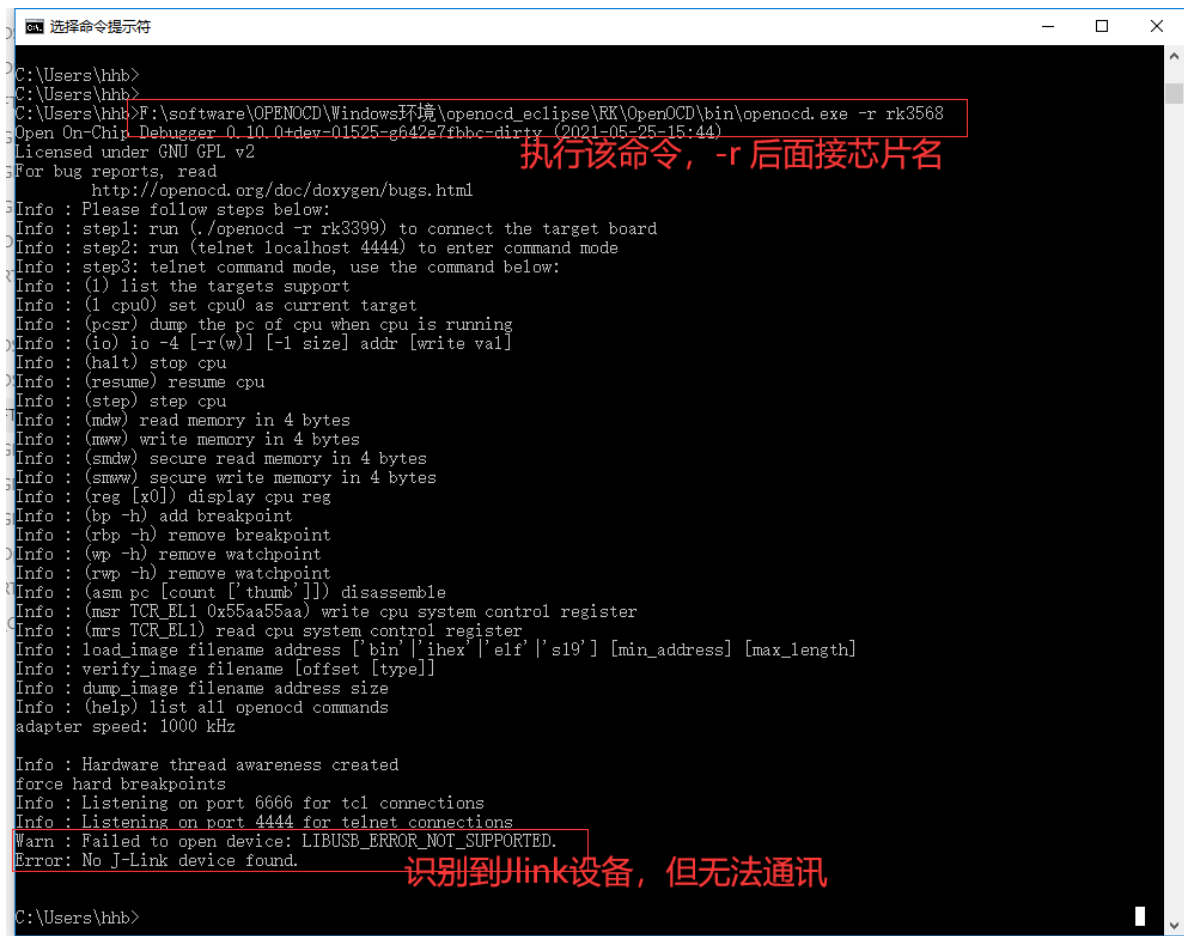
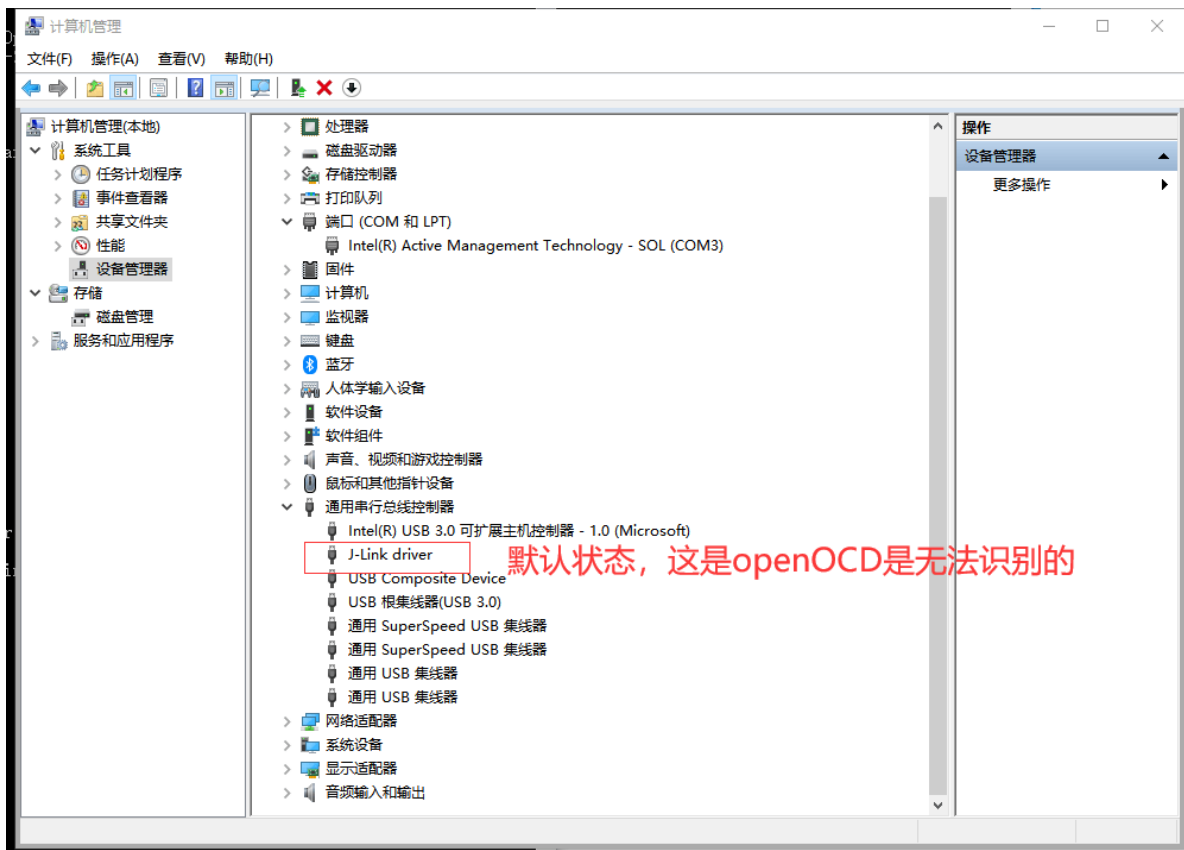
- 1 点开 IO Pins
- 2 选中 Group AD
- 3 Drive 选择 8mA, 这可以改善 TCK 30MHz 波形

4.5 开始编程



- 1 点击闪电按钮
- 2 开始编程
- 3 查看编程结果

5. Windows上Jlink适用OpenOCD



参照FT232H，替换成WinUSB驱动：

