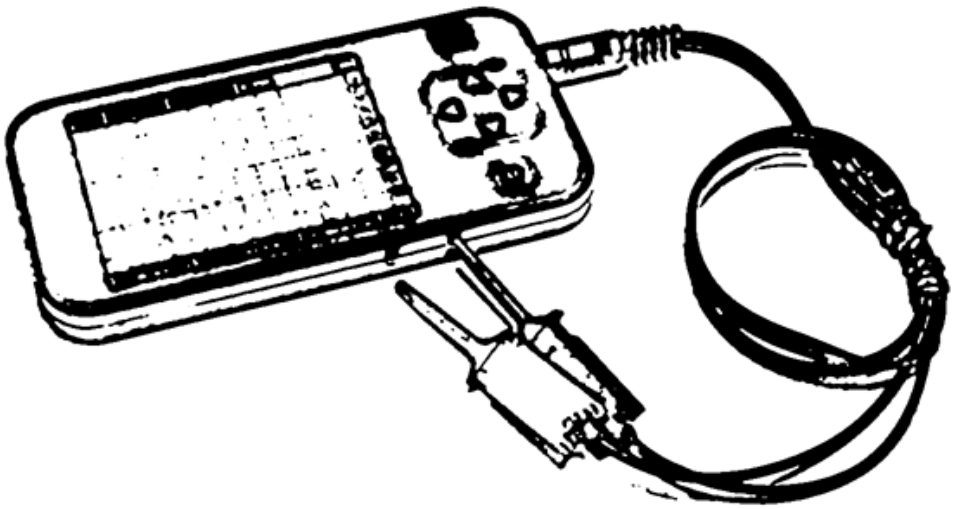
DSO Nano Manual

v1.0b



Intro

DSO mobile is a pocket size digital storage oscilloscope fulfills basic electronic engineering requirements. It is base on ARM Cortex™-M3 compatible 32 bit platform, equipped with 320*240 color display, SD card capability, USB connection, and chargeable batteries.

Features

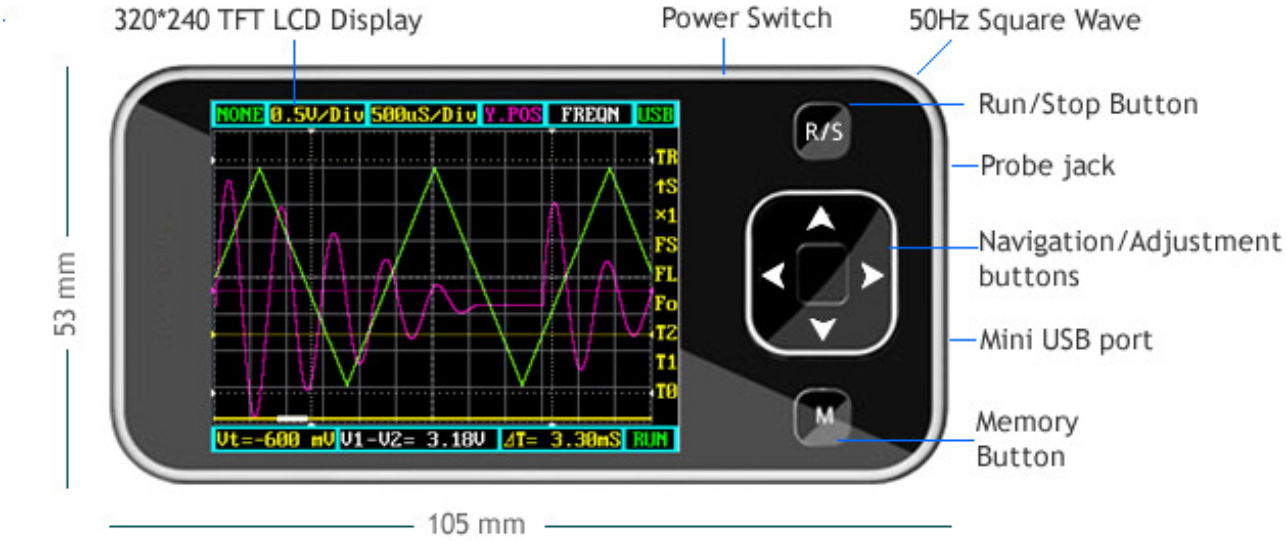
- Super portable and lightweight
- 2.8” color 320*240 display
- Micro SD card Waveform Storage
- Basic 1Msps sample rate with 12bit resolution
- Various measurement markers
- Various trigger mode
- Build-in test signal
- USB chargeable battery
- Open source

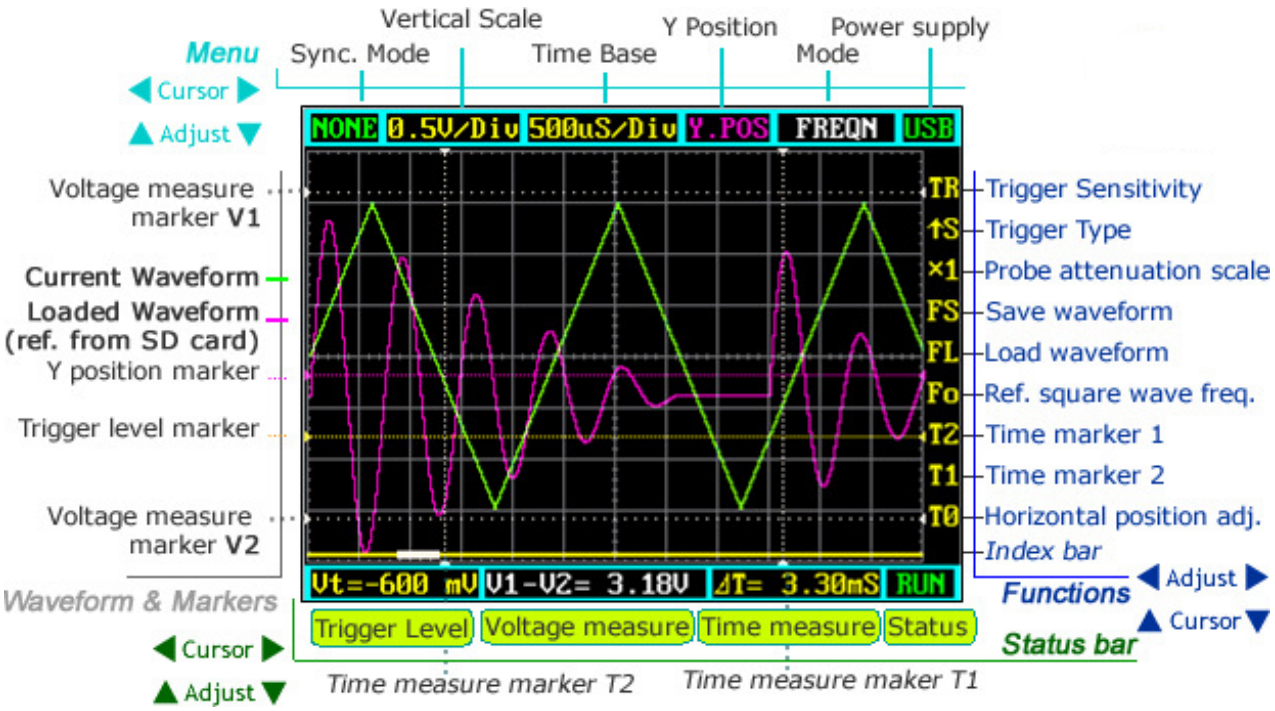
Specification

Display	2.8" Color TFT LCD
Display Resolution	320×240
Display Color	65K
Analog bandwidth	0 - 1MHz
Max sample rate	1Msps 12Bits
Sample memory depth	4096 Point
Horizontal sensitivity	1uS/Div ~ 10S/Div (1-2-5 Step)
Horizontal position	adjustable with indicator
Vertical sensitivity	10mV/Div ~ 10V/Div (with ×1 probe)
	0.5V/Div ~ 10V/Div (with ×10 probe)
Vertical position	adjustable with indicator
Input impedance	>500KΩ
Max input voltage	80Vpp (by ×1 probe)
Coupling	DC
Trig modes	Auto, Norma, Single, None and Scan
Functionalities:	Automatic measurement: frequency, cycle, duty, Vpp, Vram, Vavg and DC voltage
	Precise vertical measurement with markers
	Precise horizontal measurement with markers
	Rising/falling edge trigger
	Trig level adjustable with indicator
	Trig sensitivity adjustable with indicator
	Hold/run feature
Test signal	Built-in 10Hz ~ 1MHz (1-2-5 Step)
Waveform storage	SD card
PC connection via USB	as SD card reader
Upgrade	by bootloader via USB
Power supply	3.7V Chargeable Lithium battery / USB
Dimension (w/o probe)	105mm X 53mm X 8mm

Instructions

User interface





Basic usage

The UI could be divided to 4 parts: main menu (top), functions (right column), status bar (bottom), and waveform & markers displays. Use cursor ▲, ▼, ◄, ► to navigate among the three operational parts and make adjustments.

Waveform & Markers

Green waveform - current signal being monitored

Purple waveform – reference waveform loaded from SD card.

Voltage measure marker V1 and V2 (Dot, vertical) – A voltage measure value between V1-V2 could be displayed.

Time measure marker A and B (Dot line, horizontal) – A time measure value between A and B could be displayed.

Y positions marker (Purple) – Y position center line for adjustment reference

Trigger level marker (Yellow) – Used to set trigger level

Menu

Horizontal main menu on top of screen, Navigate by ◄,► , adjust by ▲,▼

Sync. Mode: When blinking, press ▲ and ▼ to select 4 different synchronization mode: AUTO, NORM, SING, and NONE.

AUTO – Automatic synchronous sweeping mode, displays waveform even not triggered.

NORM – Normal synchronous sweeping mode, displays whenever trigged.

SING- Single sweeping mode, display when triggered, then stopped with latest triggered waveform.

NONE – Random sampling mode

SCAN – Scan mode, to check long period low frequency signal.

Vertical Scale: When blinking, press ▲ and ▼ to select different level of sensitivity. Total 19 scales are optional from 10mV/Div to 100V/Div. Note 1: If you use scale above 20V/Div, please use probe with attenuation of 10:1). Note 2: If newly set scale does not match reference waveform, the latter will be cleared.

Horizontal sensitivity: When blinking, press ▲ and ▼ to select different sensitivities. , from 1uS/Div to 10S/Div total 22 grades. Note 2: If newly set sensitivity does not match reference waveform, the latter will be cleared.

Y position: When blinking, press ▲ and ▼ to adjust the vertical position of the waveform. Press M to hide/activate Y position marker if needed.

Calculation Mode: Auto calculation modes include:

FREQN – Signal frequency

CYCLE – Signal period

DUTY – Duty time

Vpp – AC signal peak-peak value

Vram – AC signal effective value

Vavg – AC signal average value

DC.V – DC signal average value.

Power supply mode: Power supply by internal battery or USB port. Battery bar will be displayed when powered from internal.

Functions

Vertical function buttons on side of screen, Navigate by ▲, ▼ adjust by◄,►

Trigger sensitivity: When blinking, press ◄ and ► to adjust trigger sensitivity, trigger level marker (Yellow dotted area) changes correspondingly.

Trigger Type: When blinking, press ◄ and ► to choose trigger mode of rising edge or falling edge.

Probe attenuation scale: When blinking, press ◄ and ► to choose 1:1 or 1:10 probe.

Save waveform: When blinking, status bar will display " Save Filexxx", press ◄ and ► to select file name with xxx = 000-255. Press M to save current waveform on display to SD card.

Load waveform: When blinking, status bar will display " Save Filexxx", press ◄ and ► to select file name with xxx = 000-255. Press M to load current waveform to display from SD card.

Note: current version has no file creation function, a FILEXXX.DAT must be prepared by connecting to PC by USB.

Ref. square wave freq.: When blinking, press ◄ and ► to adjust the frequency of reference square wave.

Horizontal position adj.：When blinking, press ◄ and ► to scroll waveform horizontally.

Index Bar: Show current display position of total loaded wavefrom

Status Bar

Time markers.: When blinking, press ◄ and ► to adjust T1 or T2 time measure marker, the time difference ΔT=T1-T2 will be displayed.

Voltage markers: When blinking, press ◄ and ► to adjust V1 or V2 time measure marker, the Voltage difference ΔV=V1-V2 will be displayed.

Trigger level: When blinking, press ◄ and ► to adjust trigger level, trigger level marker (Yellow dotted line) changes correspondingly.

Save Settings

Hold "R/S" Button and press "M" button to save current settings as default.

Firmware upgrade

It's easy to upgrade firmware with USB bootloader.

1. Download "DfuSe USB Device Firmware Upgrade" from http://www.st.com/stonline/products/support/micro/files/um0412.zip and install. Instruction available at http://www.st.com/mcu/familiesdocs-110.html#Application%20Note.
2. Connect Oscilloscope with PC, press and hold [–], switch on power, until oscilloscope displays:

   "Please Connect to USB Host!"

   "DS0201 Device Firmware Upgrade Ver 1.0"

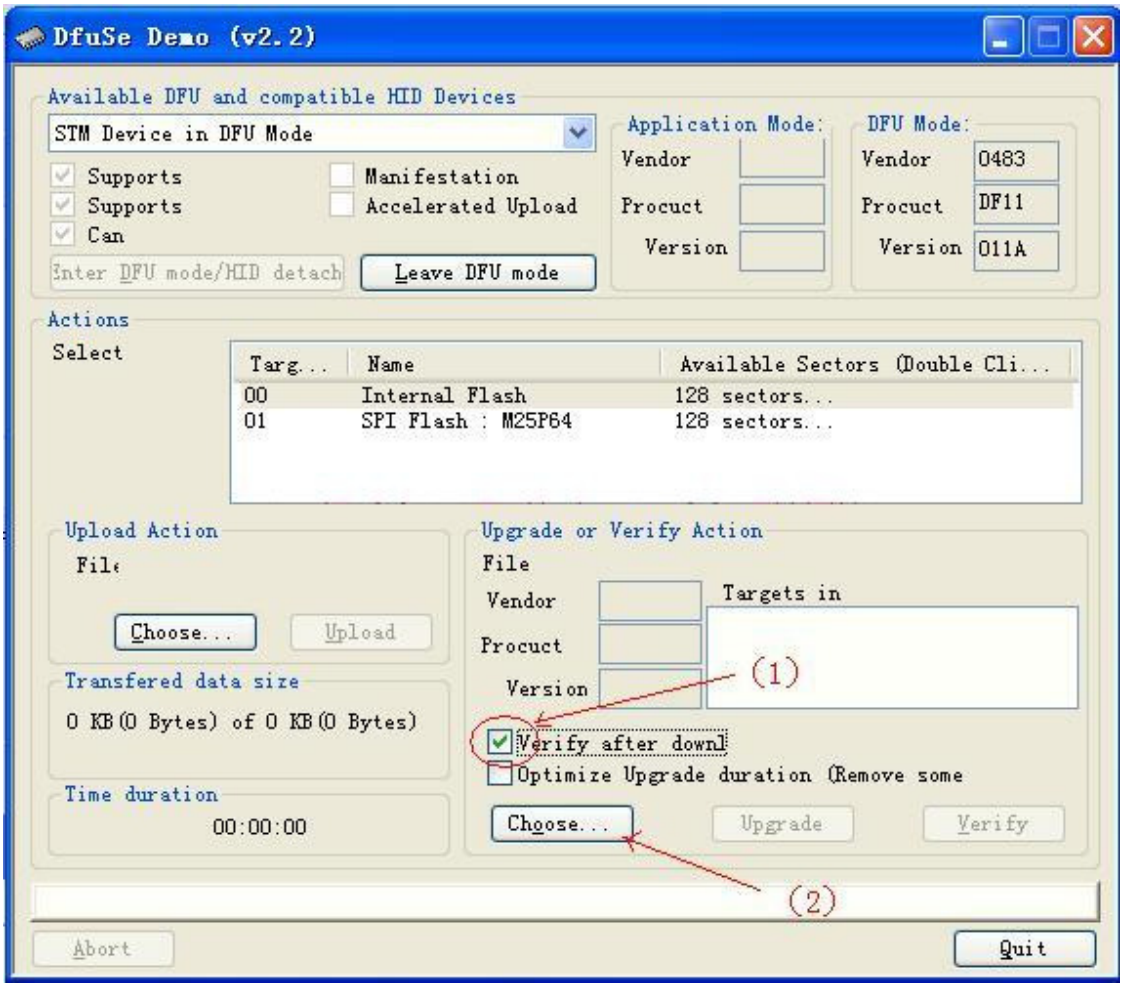
   When PC connection is detected,

   "Firmware Upgrading..."

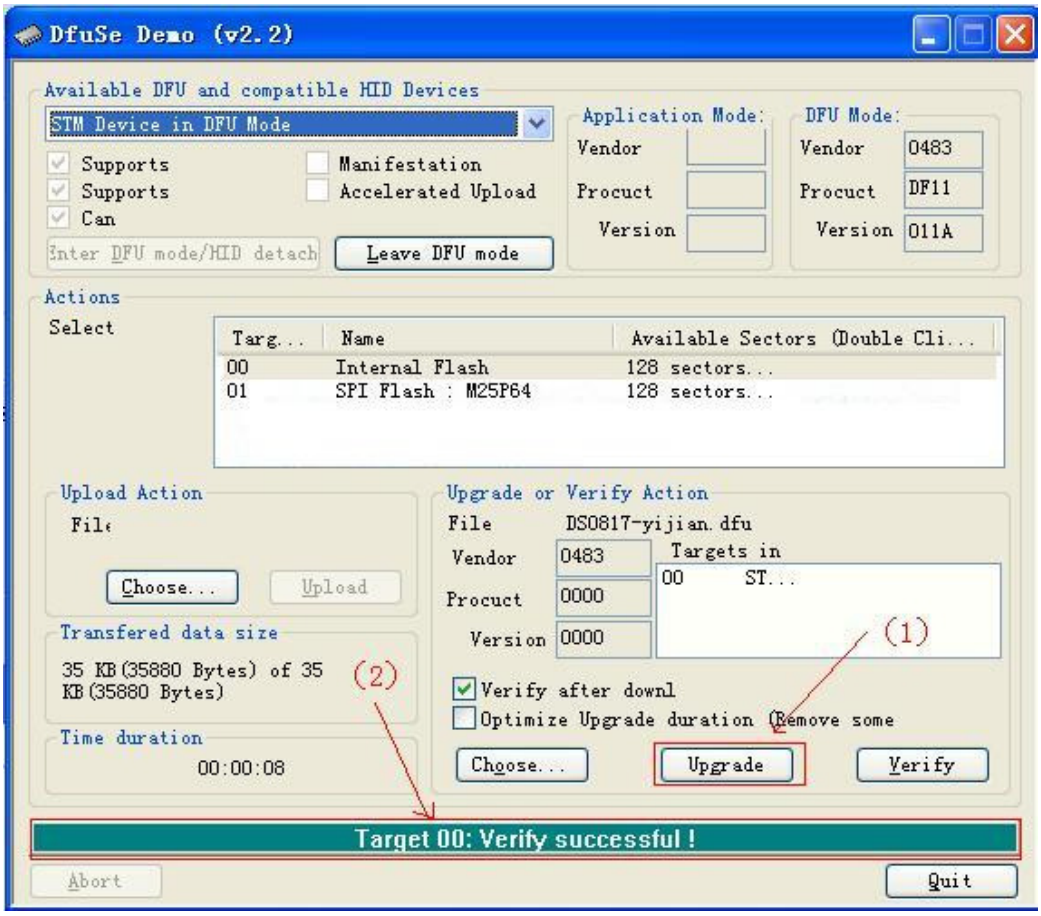
   "Please Wait"

   "DS0201 Device Firmware Upgrade Ver 1.0"

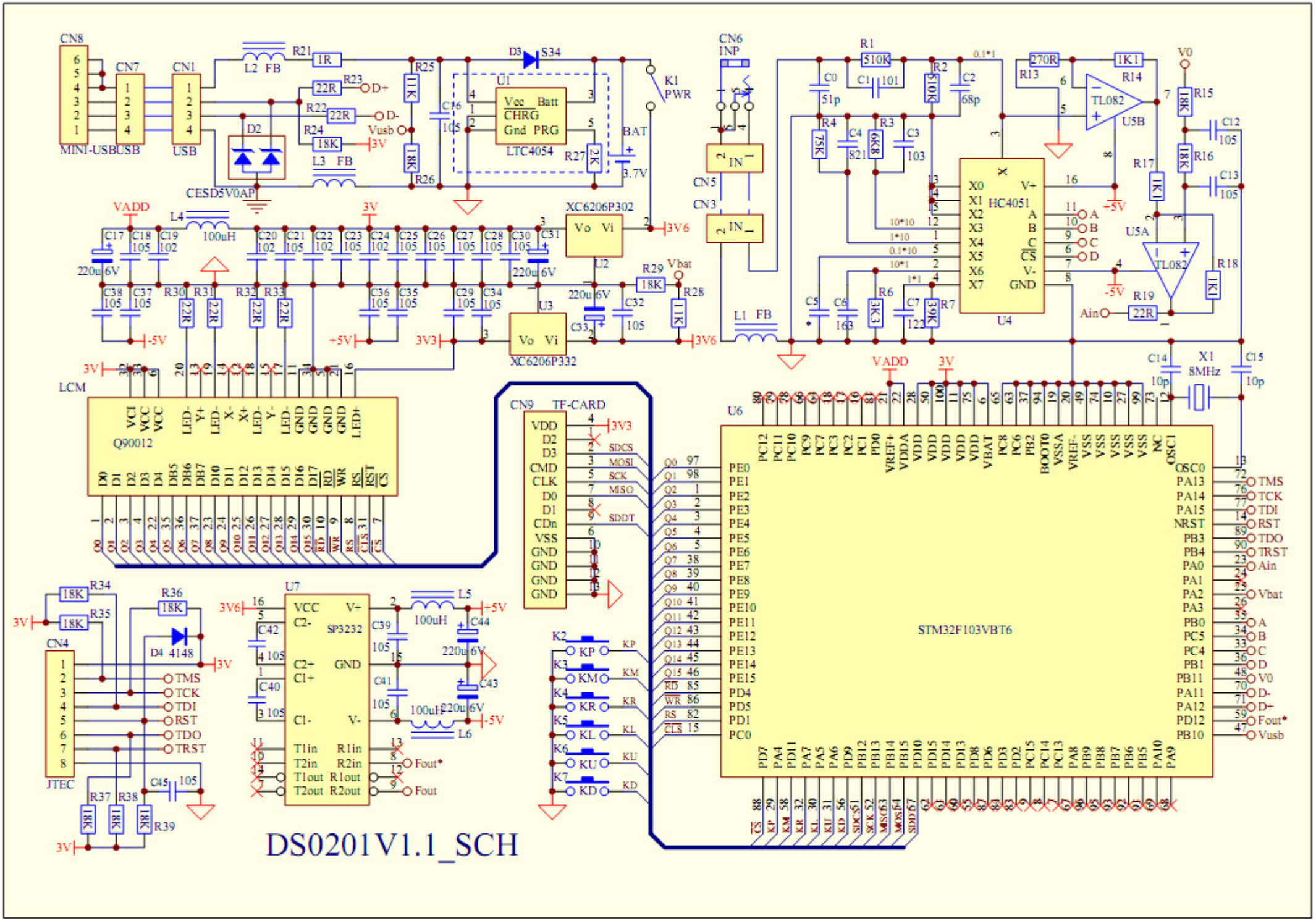
3. Run "Dfuse Demo" on PC, check (1）, select firmware to be uploaded （e,g."DS0201_FW_V2.00.DFU"）at（2）



4. In the next screen, press（1）"Upgrade", when upgrade finishes successfully, status bar will notify（2）



5. Shut down and reactivate power to use new firmware.


CN8
MINI-USB
CN7
USB
CN1
USB
L2 FB
R21 1R
R23 22R D+
R22 22R D-
R24 18K Vusb 3V
L3 FB
D2
CESD5V0AP
R25 11K
R26 18K
C16 105
U1
Vcc Batt
CHRG
Gnd PRG
LTC4054
D3 S34
R27 2K
BAT
3.7V
K1 PWR
CN6 INP
CN5
CN3
IN
IN
L1 FB
VADD
3V
L4 100uH
C17 220u 6V
C18 105
C19 102
C20 102
C21 105
C22 102
C23 105
C24 102
C25 105
C26 105
C27 105
C28 105
C30 105
C31 220u 6V
C38 105
C37 105
R30 22R
R31 22R
R32 22R
R33 22R
C36 105
C35 105
C29 105
C34 105
-5V
+5V
3V3
XC6206P302
Vo Vi
U2
3V6
R29 18K
Vbat
R28 11K
C32 105
C33 220u 6V
U3
XC6206P332
Vo Vi
3V6
R1 510K
C0 51p
C1 101
R2 510K
C2 68p
0.1*1
R4 75K
C4 821
R3 68K
C3 103
10*10
1*10
0.1*10
10*1
1*1
R6 3K3
C7 123
R7 39K
C5
C6 103
X
HC4051
X0 X1 X2 X3 X4 X5 X6 X7
V+ A B C CS V- GND
U4
+5V
-5V
R13 270R
R14 1K1
TL082
U5B
V0
R15 18K
R16 18K
R17 1K1
C12 105
C13 105
U5A
TL082
R18 11K
R19 22R
Ain
C14 10p
X1 8MHz
C15 10p
LCM
Q90012
VCI VCC VCC
LED- Y+ LED- X- X+ LED- Y- LED- GND GND GND GND LED+
D0 D1 D2 D3 D4 DB5 DB6 DB7 D10 D11 D12 D13 D14 D15 D16 D17 RD WR RS RST CS
CN9 TF-CARD
VDD D2 D3 CMD CLK D0 D1 CDn VSS GND GND GND GND
3V3
SDCS MOSI SCK MISO SDDT
U6
STM32F103VBT6
PE0 PE1 PE2 PE3 PE4 PE5 PE6 PE7 PE8 PE9 PE10 PE11 PE12 PE13 PE14 PE15 PD4 PD5 PD1 PC0
PC12 PC11 PC10 PC9 PC7 PC3 PC2 PC1 PD0 VREF+ VDDA VDD VDD VDD VDD VBAT PC8 PC6 PB2 BOOT0 VSSA VREF- VSS VSS VSS VSS NC OSC1
OSC0 PA13 PA14 PA15 NRST PB3 PB4 PA0 PA1 PA2 PA3 PB0 PC5 PC4 PB1 PB11 PA11 PA12 PD12 PB10
PD7 PA4 PD11 PA7 PA5 PA6 PD9 PB12 PB13 PB14 PB15 PD10 PD15 PD14 PD13 PD8 PD6 PD3 PD2 PC15 PC14 PC13 PA8 PB9 PB8 PB7 PB6 PB5 PA10 PA9
TMS TCK TDI RST TDO TRST Ain Vbat A B C D V0 D- D+ Fout* Vusb
K2 KP
K3 KM
K4 KR
K5 KL
K6 KU
K7 KD
R34 18K
R35 18K
R36 18K
D4 4148
CN4
JTEC
TMS TCK TDI RST TDO TRST
C45 105
R37 18K
R38 18K
R39 18K
U7
SP3232
VCC V+ C2- C2+ GND C1+ C1- V-
T1in T2in T1out T2out R1in R2in R1out R2out
C42 105
C40 105
C39 105
C41 105
L5 100uH
L6 100uH
C44 220u 6V
C43 220u 6V
+5V
-5V
Fout*
Fout
DS0201V1.1_SCH