AW-WSA Sensor User Manual

V1.3

Document information

Info	Content
Keywords	*LoRaWAN(LoRaMAC), Long Range, Low power, Sensor, IOT, Temperature,Humidity, Loudness, 3-Axis, IR Temperature*
Abstract	Instructions for AW-WSA Sensor Devices

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1 Introduction

AW-WSA is a wireless sensor device made by Air-World which could be used to collect data from several kinds of Sensors, temperature&humidity, Loudness, Infrared temperature, 3-Axis and so on. WSA is short for Wireless Sensor Access. The AW-WSA is LoRaWAN protocolcompatible device.

Key features:

- Air-World's ultralow power **LoRaWAN** module AW76-052
  With sleep current1.45uA
- Support 434/470/868/915MHz
- I2C interface to connect to several kinds of Sensor (Optional)
  Temperature & Humidity Sensor;
  Loudness Sensor;
  Infrared Temperature Sensor;
  3-Axis Sensor;
  Others;
- Optional battery:
- 800mAh Li-Ion battery or 1700mAh Li-Ion battery
- Chargeable with Mini-USB
- USB for FW update (boot loader)
- 4 LEDs to show status
- SMA connector for antenna
- Mechanical Power Switch
- Size: 80mm X 90mm X23.8mm
- Could be used as Lora modem support AT command

2 HW description

2.1 Outline and Operation

Figure 2-1 is the pic shown the outline of the AW-WSA sensor device.

(1) SMA for antenna—
Please connect to the antenna with right band.

(2) 4 LEDs—
Red Led: Blink when transmitting.
Green Led: Blink when Receiving.
Blue Led: Not used in current
Orange Led: Not used in current

(3) Air Hole for Sensor data collection—
Used for data collection for Sensor Module inside enclosure.

(4) Charging LED—
A green Led. When there is USB cable connected,
Led ON: Charging;
Led OFF: Charged.

(5) Mini USB—
For charging and FW update(DFU).

(6) Power Switch—
Turn left is OFF;
Turn right is ON.

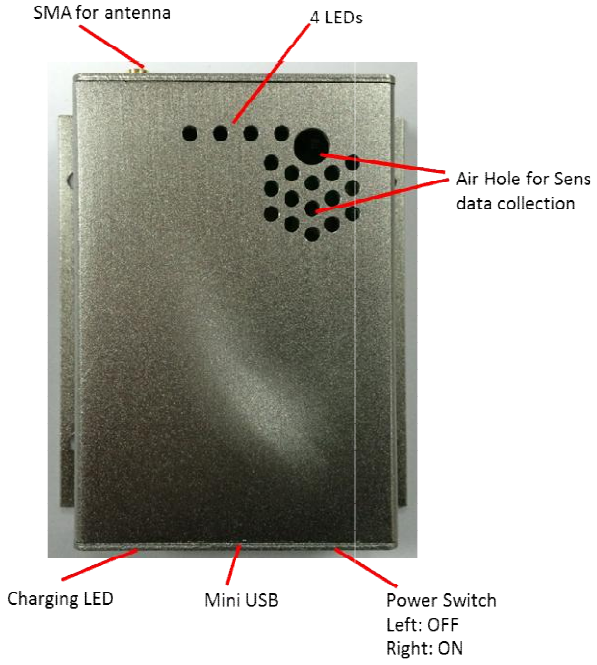

Figure 2-1 Outline of AW-WSA

2.2 Block diagram

Figure 2-2 is simple block diagram of AW-WSA.
The core part of AW-WSA is the low power small size dual band LoRaWAN module AW76-052 designed by Air-World. The module's sleep current is only 1.45uA. So the module is very suitable for sensor device which is supplied by battery. For more information of AW76-052, please refer to the datasheet of AW76-052 or contact with Air-World.
AW-WSA is powered by a Li-Ion battery, which means it could be chargeable. And there are 2 selections for the battery capacity, 800mAh or 1700mAh.
Several kinds of Sensors could be chosen for AW-WSA base on the I2C and SPI. You could connect the AW-WSA to several kinds of Sensor modules via I2C or SPI, such as Temperature & Humidity, Loudness, Infrared Temperature, 3-Axis and so on.
Based on the dual band LoRaWAN module AW76-052, you could make the AW-WSA work on 434/470MHz or 868/915MHz. Please contact with Air-World when you need change the operation band.

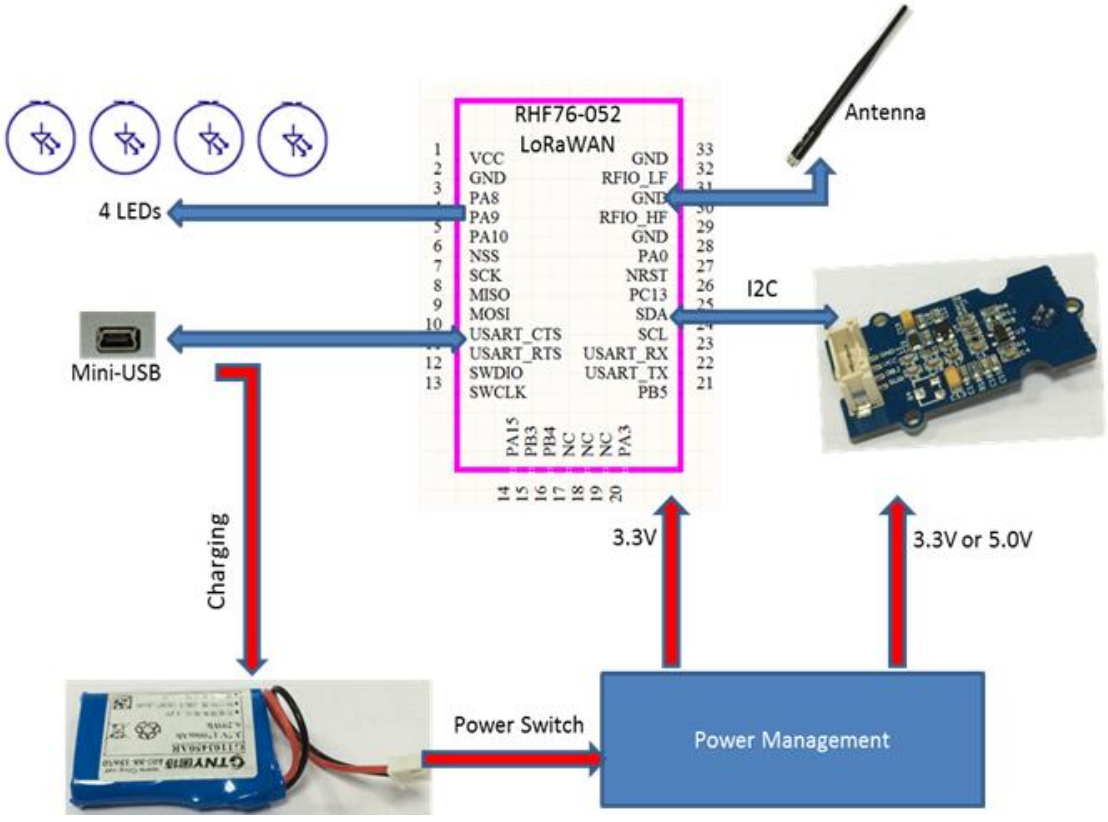

Figure 2-2 Block diagram of AW-WSA

3 Configuration

3.1 Common

Default Frequency:

CH0 868.1MHz
CH1 868.3MHz
CH2 868.5MHz

Second RX Window:

SF9, 869.525MHz

Note:Need more application with different frequency, please contact with Air-World for FW update.

Port:

17

3.2 Temperature and Humidity

Packet interval:5min±1s
Battery Life (800mAh): 0.5 ~1.5 Year[1]

3.3 Loudness

Sample interval: ~5s
Packet interval: 2.7min
Battery Life (800mAh): ~1week[2]

3.4 3-Axis Accelerator

Packet interval: 5min±1s
Battery Life (800mAh): 0.5 ~1.5 Year

3.5 Infrared Temperature

Packet interval: 5min±1s
Battery Life (800mAh): 0.5 ~1.5 Year

[1] ADR affects battery life, 0.5 year is calculated assume that AW-WSA keeps work with SF12.
[2] Limited by loudness sensor AW-WSA device costs much power.

4 Data format

4.1 Temperature and Humidity

AW-WSA temperature and humidity sensor returns 4 bytes payload each packet. For example:

09	0c	06	2e

First 2 bytes are for temperature, last 2 bytes are for humidity.

Temperature Conversion:
T_s= 0x090c ->T =T_s/32 - 50 -> T = 0x090c/32 - 50 -> T = 2316/32 - 50 = 22.4°

Humidity Conversion:
RH_s = 0x062e-> 100RH = RH_s/16-24 ->100RH = 0x062e/16-24=74.9 ->RH = 74.9%

4.2 Loudness

AW-WSA loudness sensor returns 32 bytes each packet.

27	1a	1c	17	21	2d	…	…	…	…	…	…	…	22	2c	15	22	22	18

Each byte in the packet stands for one sample. Interval between each sample is ~5s.
The sample unit is V. For example:

Vs = 0x27 -> V = Vs/100 = 39/100 = 0.39V

Note: Voltage and sound dBare positively correlated, but the conversion table need do calibration in special voice lab with special devices, this part is missing.

4.3 3-Axis Accelerator

Figure 4-1 Axes of Acceleration Sensitivity

AW-WSA 3-Axis Acceleratorsensor returns 6 bytes payload each packet, 2 bytes for each direction. For example:

00	38	00	87	00	d2

First 2 bytes are for x-axis, mid 2 bytes are for y-axis, last 2 bytes are for z-axis.
Acceleration Conversion: (g is acceleration of gravity, ~9.8m/s²)
AX_s = 0x0038 -> AX = AX_s/256 * g -> AX = 0x38/256 g = 0.22g
AY_s = 0x0084 -> AY = AY_s/256 * g -> AY = 0x84/256 g =0.52g
AZ_s = 0x00d2 -> AZ = AZ_s/256 * g -> AZ = 0xd2/256 g = 0.82g

4.4 Infrared Temperature

AW-WSA Infrared sensor returns 2 bytes payload each packet. For example:

09	1f

Temperature Conversion:

T_s= 0x091f -> T = T_s/100 -> T = 0x091f/100 -> T = 2335/100= 23.5°

5 Upgrade

All AW-WSA devices have been built bootloader inside. This makesAW-WSA device could be upgraded by user easily.

5.1 Install Tools

Download DfuSe tool from ST official website. Extract and install DfuSe tool. Please install **xxx_amd64** suffix software if your PCis 64bits, 32bits user should install the other one.

5.1 Enter Bootloader Mode

A “Power OFF ->Connect USB ->Power ON” sequence could be used to enablebootloader mode. After bootloader is enabled, LEDs of AW-WSA will be blinking.

5.2 Connect to PC and Install Driver

Once powered on, Windows7 will search the driver for AW-WSA automatically. Once inst alled, an STM device could be seen from Device Manager. If installed failed, please try to install driver manually. The driver is placed at ***C:\Program Files (x86)\STMicroelectronics\Software\DfuSe\Driver***, if you don’t change the installation directory.

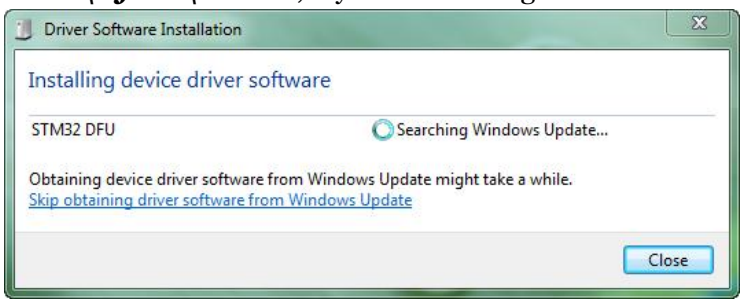

Figure 5-1STM32 DFU Installing Driver

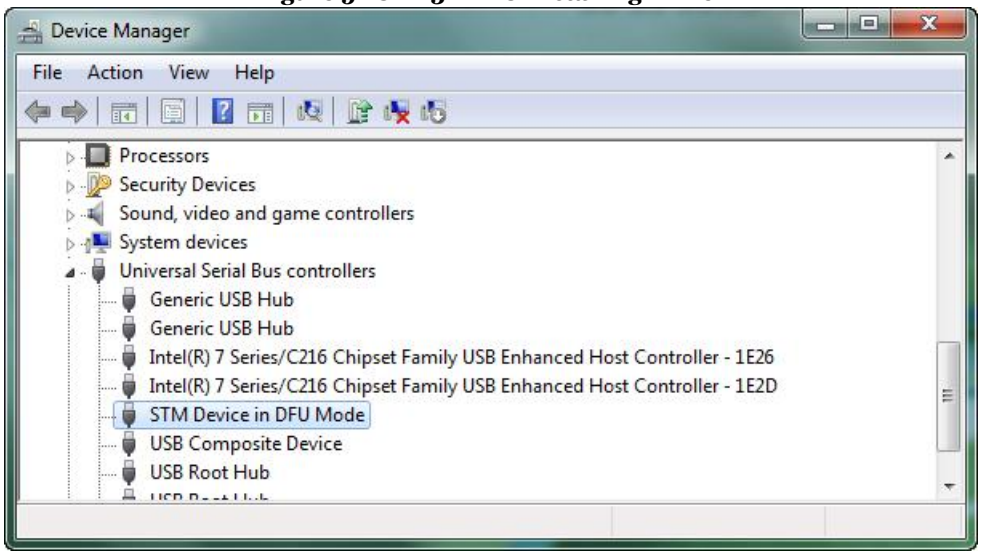

Figure 5-2Sensor Node DFU Bootloader Mode

5.3 Upgrade

Please follow the pictures below to upgrade. (Note: Please leave verify after download option unchecked)
Firmware is in **.dfu**format.

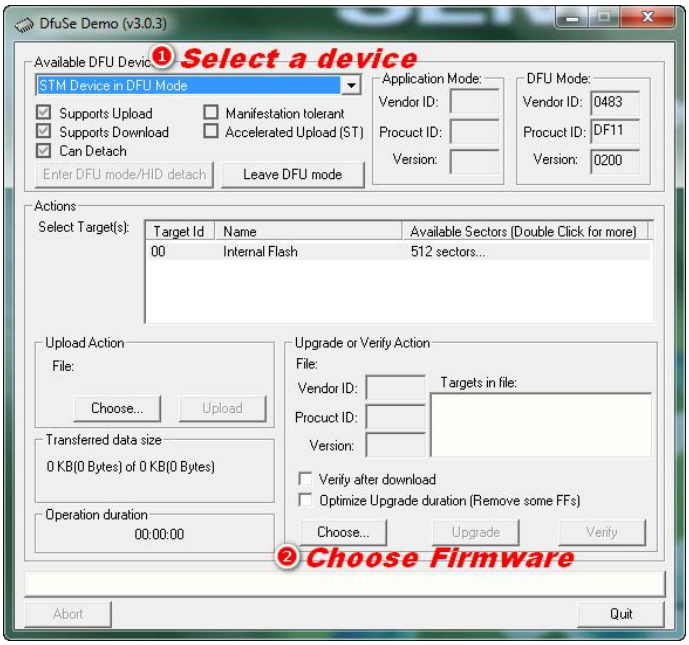

Figure 5-3DfuSe Panel

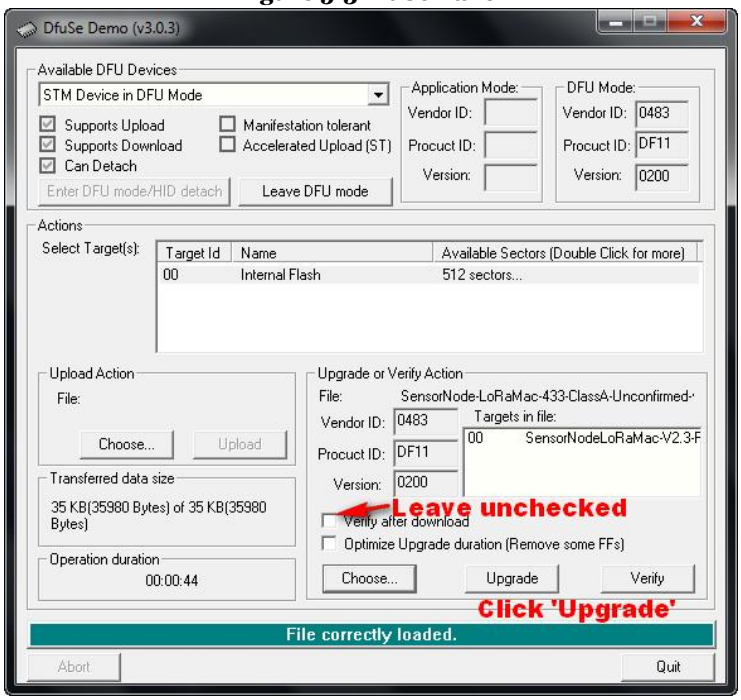

Figure 5-4Dfu Firmware Choosed

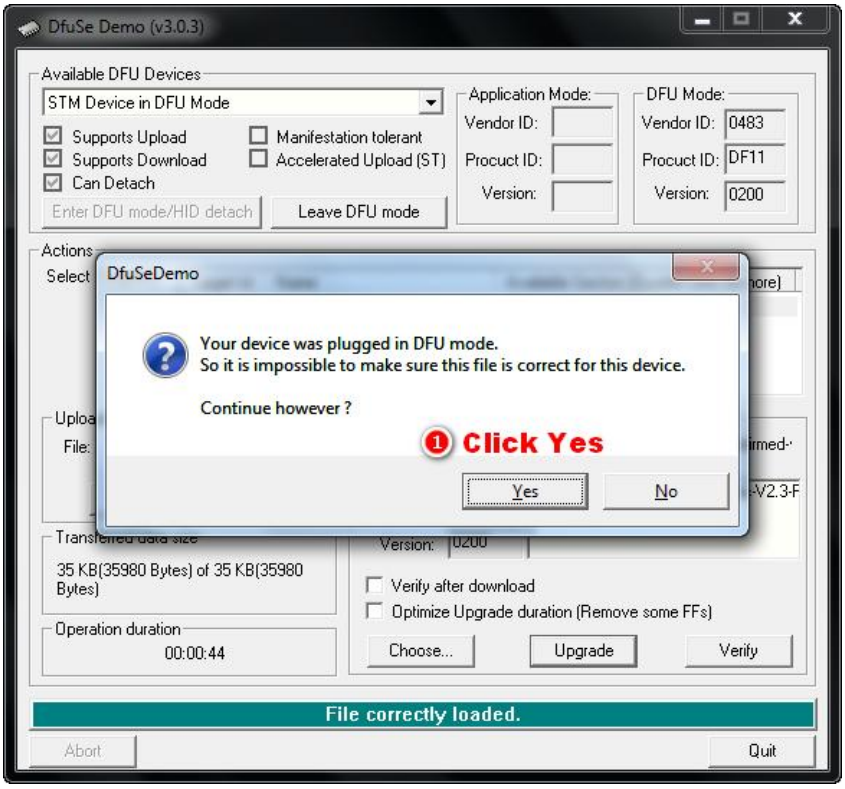

Figure 5-5Confirm to Upgrade

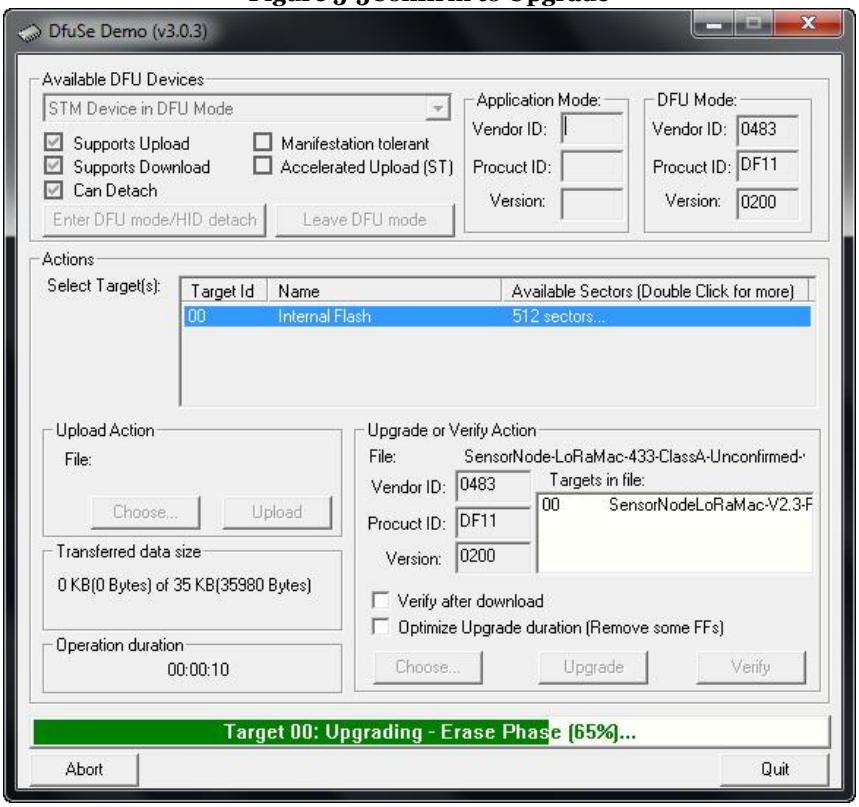

Figure 5-6Erasing

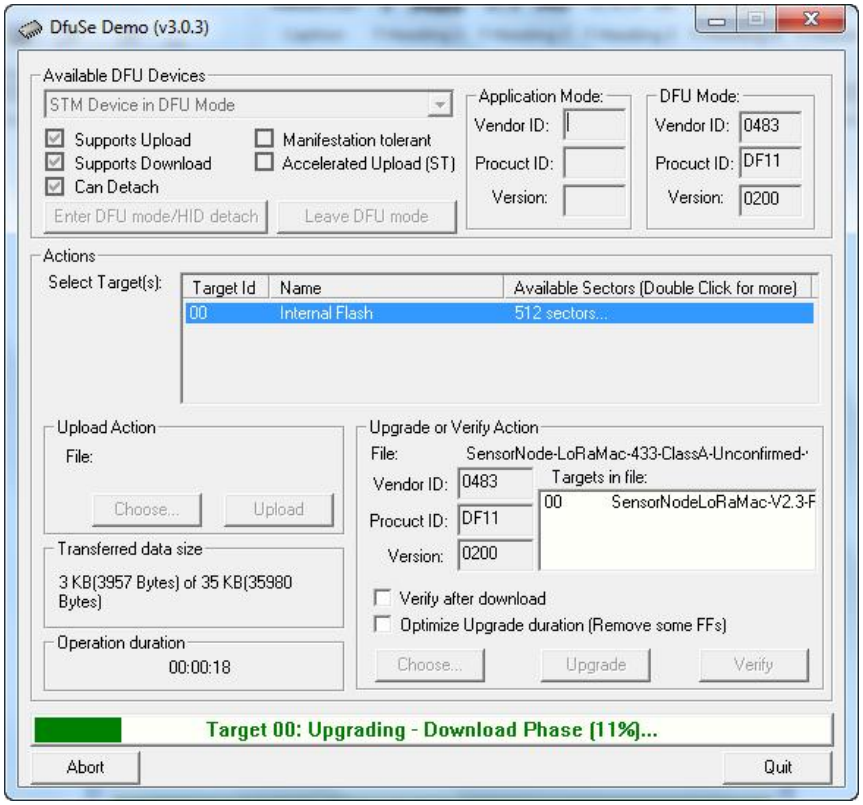

Figure 5-7Downloading

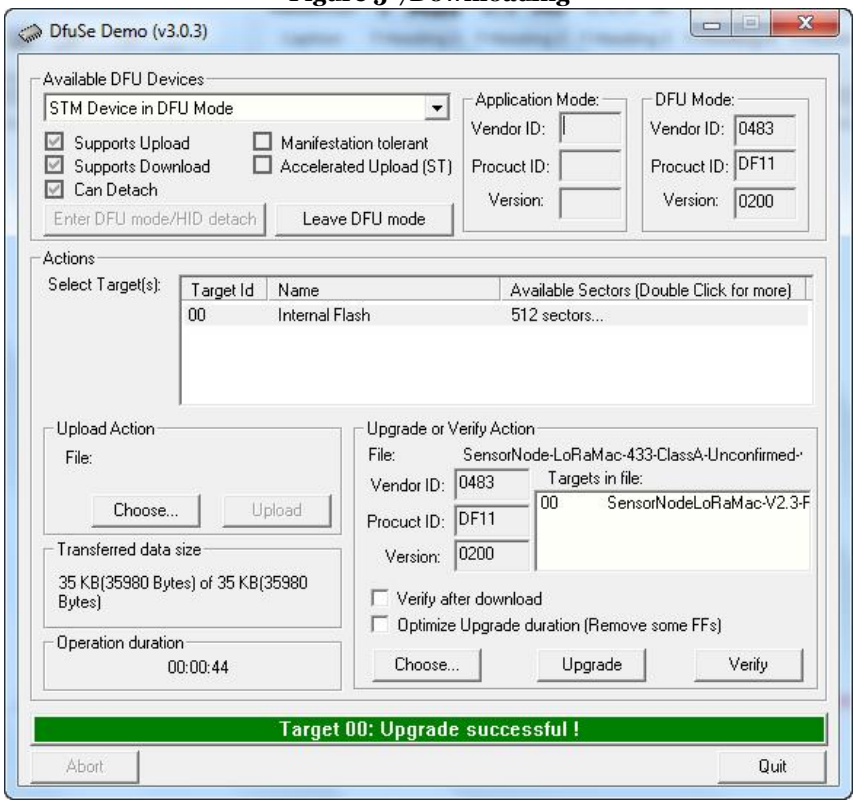

Figure 5-8Done

Change Log

V1.3 2015-04-07
+ Add IR temperature and 3-Axis Accelerator section

V1.2 2015-03-15
+ Fix typo, fine-tune layout, and reorder“Change Log”

V1.1 2015-03-15
+ Update HW description

V1.0 2015-02-28
+ First Release

http://www.Air-World.com