# Technical Report No.: 60.850.14.070.03R
# Dated: 2016-06-26

**CLIENT:**

| | |
|---|---|
| **Company Name:** | I.R.I.S.s.a. |
| **Address:** | I.R.I.S. s.a rue du bosquet 10 1348 Louvain-La-Neuve Belgium |

**MANUFACTURING PLACE:**

| | |
|---|---|
| **Company Name:** | Systech Electronics Ltd. |
| **Address:** | 26/F Lever Tech Centre, 69-71 King Yip Street, Kwun Tong, Kowloon, Hong Kong |

**TEST SUBJECT:**

| | | |
|---|---|---|
| **Product** | : | Mouse scanner |
| **Model** | : | IRIScan™ Mouse Wifi |

**TEST SPECIFICATION:** **EN 300328 V1.8.1 (2012-06), EN 62311:2008**

**PRUPOSE OF EXAMINATION:**

EN 300328: Wideband transmission systems; Data transmission equipment operating in the 2.4GHz ISM band and using wide band modulation techniques; And EN 62311:2008 Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz - 300 GHz)

**TEST RESULTS:** **POSITIVE**

**Positive:** The results show that the presented product is in compliance with the specified requirements.

**Negative:** The present test results show that after removal of the points of non-compliance as listed in the report and an appropriate retest the product is in compliance with specified requirements. A retest of a modified product is necessary. A certification can be recommended at a positive result.



**TÜV SÜD South Region Report Template No. (TEL_SR_F_12.31E)**
**This test report has total number of pages is 53 .**

| Prepared by: Simon Wang | Approved by: John Zhi |
|---|---|
| Project Engineer<br>Date: 2016-06-26 | Section Manager<br>Date:2016-06-26 |


TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
Building 12&13, Zhiheng Wisdomland Business Park, Nantou Checkpoint Road 2, Nanshan District, 518052 Shenzhen, CHINA

# LIST OF MEASUREMENTS




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Building 12&13, Zhiheng Wisdomland Business Park, Nantou Checkpoint Road 2, Nanshan District, 518052 Shenzhen, CHINA

# TEST REPORT SUMMARY

| | | |
|---|---|---|
| **Applicant** | : | I.R.I.S.s.a<br>I.R.I.S. s.a rue du bosquet 10 1348 Louvain-La-Neuve Belgium |
| **Manufacturer** | : | Systech Electronics Ltd.<br>26/F Lever Tech Centre, 69-71 King Yip Street, Kwun Tong, Kowloon, Hong Kong |
| **Regulation Applied** | : | EN 300328 V1.8.1 (2012-06)<br>EN 62311 (2008) |
| **Model** | : | IRIScan™ Mouse Wifi |
| **Date of Test Item Received** | : | 2014-12-09 |
| **Date of Test Started** | : | 2014-12-10 |
| **Date of Test Completed** | : | 2016-06-26 |

WE HEREBY CERTIFY THAT:

The data shown in this report were made in accordance with the procedures given in EN 300328 V1.8.1 (2012-06) and the energy emitted by the device was found to be within the limits of applicable. The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities.

Note:

1. The results of the testing report only related to the tested item.
2. The testing report shall not be reproduced except in full, without the written approval of the test laboratory.
3. The manufacturer has the sole responsibility of continued compliance of the devices.
4. The result of the testing report shown as the worst case.

# GENERAL INFORMATION

## Description of EUT:

The EUT is the Mouse scanner with Scanner function.

## Product Information:

| General Information of EUT |
|---|
| **Primary function :**<br>☒ Data, message transfer<br>☐ Audio transfer<br>☐ Others, Video & Audio transfer<br><br>**Type of equipment:** Stand alone<br><br>**Equipment classification**<br>☐ Fixed use<br>☒ Portable use<br>☐ Vehicle use<br><br>**List of ports**<br>☐ No input/output port<br>☐ AC mains input/ DC output ports<br>☒ DC power input/output ports, DC-cable longer than 3 m ? ☐ Yes ☒ No<br>☐ Signal ports, single cable longer than 3 m? ☐ Yes ☐ No<br>☐ Telecommunication ports<br>☐ Control ports, control cable longer than 3 m ? ☐ Yes ☐ No |

## Technical Specification of EUT

**Equipement type:**

☒ Wideband equipment
☐ FHSS equipment

**Type of modulation:** DSSS for IEEE 802.11b (BPSK / QPSK / CCK);
OFDM for IEEE 802.11g/n (BPSK / QPSK / 16QAM / 64QAM)

**Antenna type :** Integral

**Antenna gain (dBi):** 2 dBi (Mouse Part)

**Power class and maximum permissible power:** 11 (100 mW)

**Different carrier power settings:** ☒ No ☐ Yes,

**Operating frequency:** 2400 - 2483.5 MHz

**Power supply**

☐ Main Source (AC/DC Switching Adaptor)
Input Voltage:

☒ Battery operated

☐ Regulated lead-acid battery
☒ Others, DC 3.7V, 650mAh Li-ion Rechargeable Battery

**Operating mode of EUT :**

☒ Adaptive
☐ Non-adaptive
☒ Not capable to produce an unmodulated carrier
☐ Capable to produce an unmodulated carrier
☐ Standby - Off

**Frequency of each WiFi channel:**

| 13 Channels (IEEE802.11b/g/nHT20) | | | | |
|---|---|---|---|---|
| CH 1 = 2412 | CH 2 = 2417 | CH 3 = 2422 | CH 4 = 2427 | CH 5 = 2432 |
| CH 6 = 2437 | CH 7 = 2442 | CH 8 = 2447 | CH 9 = 2452 | CH 10 = 2457 |
| CH 11 = 2462 | CH 12 = 2467 | CH 13 = 2472 | | |


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| Software and Hardware Version of EUT |
|---|
| **None** |
| **Supported accessories and Equipments** |
| **None** |
| **Equipment Modification** |
| **No modification were made to the EUT.** |

## Test Location:

T12

## Test Conditions:

Normal temperature under testing : 25°C , Relative Humidity : 56 %

| Measurement uncertainty | |
|---|---|
| Parameter | Uncertainty |
| Occupied Channel Bandwidth | ±2.8% |
| RF output power, conducted | ±0.7dB |
| Power Spectral Density, conducted | ±1.5dB |
| Unwanted Emissions, conducted | ±1.5dB |
| Temperature | ±0.5°C |
| Humidity | ±3% |
| DC and low frequency voltages | ±1% |
| Time | ±2% |
| Duty Cycle | ±2% |

# ESSENTIAL RADIO TEST SUITES - EN 300 328 V1.8.1 (2012-06)

## TRANSMITTER – RF OUTPUT POWER SUBCLAUSE 5.3.2

### 1) For FHSS Modulation

**Result** **N.A.**

Operation mode: Hopping with the worst case configuration of power, modulation and bandwidth.

**For 802.11b**

| Test conditions | | RF Output Power | | | |
|---|---|---|---|---|---|
| | | Measured power (dBm) | Antenna Gain (dBi) | Beamforming Gain ( dB) | E.I.R.P (dBm) |
| Lowest Channel | | | | | |
| $T_{nom}$( ºC) | $V_{nom}$( )Vdc | --- | 0 | --- | --- |
| $T_{min}$( ºC) | $V_{min}$( )Vdc | --- | 0 | --- | --- |
| | $V_{max}$ ( ) Vdc | --- | 0 | --- | --- |
| $T_{max}$( ºC) | $V_{min}$( )Vdc | --- | 0 | --- | --- |
| | $V_{max}$ ( ) Vdc | --- | 0 | --- | --- |
| Middle Channel | | | | | |
| $T_{nom}$( ºC) | $V_{nom}$( )Vdc | --- | 0 | --- | --- |
| $T_{min}$( ºC) | $V_{min}$( )Vdc | --- | 0 | --- | --- |
| | $V_{max}$ ( ) Vdc | --- | 0 | --- | --- |
| $T_{max}$( ºC) | $V_{min}$( )Vdc | --- | 0 | --- | --- |
| | $V_{max}$ ( ) Vdc | --- | 0 | --- | --- |
| Highest Channel | | | | | |
| $T_{nom}$( ºC) | $V_{nom}$( )Vdc | --- | 0 | --- | --- |
| $T_{min}$( ºC) | $V_{min}$( )Vdc | --- | 0 | --- | --- |
| | $V_{max}$ ( ) Vdc | --- | 0 | --- | --- |
| $T_{max}$( ºC) | $V_{min}$( )Vdc | --- | 0 | --- | --- |
| | $V_{max}$ ( ) Vdc | --- | 0 | --- | --- |


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Where EIRP = Measured power + Antenna Gain + Beamforming Gain.

**LIMITS** **EN 300328 Clause 4.3.1.1.2**

The maximum RF output power for adaptive Frequency Hopping equipment shall be equal to or less than 20dBm.

The maximum RF output power for non-adaptive Frequency Hopping equipment, shall be declared by the supplier. The maximum RF output power for this equipment shall be equal to or less than the value declared by the supplier. This declared value shall be equal to or less than 20dBm.

This limit should apply for any combination of power level and intended antenna assembly.

## 2) For Wide Band Modulation

**Result** **PASS**

The EUT should be operated at the worst case configuration of power, modulation and bandwidth.

**For 802.11b**

| Test conditions | | RF Output Power | | | |
|---|---|---|---|---|---|
| | | Measured power (dBm) | Antenna Gain (dBi) | Beamforming Gain ( dB) | E.I.R.P (dBm) |
| Lowest Channel – 2412 MHz | | | | | |
| $T_{nom}$( 25 ºC) | $V_{nom}$(.3.7)Vdc | 6.895 | 2 | --- | 8.895 |
| $T_{min}$( -10ºC) | $V_{min}$(3.3)Vdc | 6.989 | 2 | --- | 8.989 |
| | $V_{max}$ (4.1) Vdc | 6.912 | 2 | --- | 8.912 |
| $T_{max}$( 45ºC) | $V_{min}$(3.3)Vdc | 6.931 | 2 | --- | 8.931 |
| | $V_{max}$ (4.1) Vdc | 6.915 | 2 | --- | 8.915 |
| Middle Channel – 2440MHz | | | | | |
| $T_{nom}$( 20 ºC) | $V_{nom}$(.3.7)Vdc | 6.896 | 2 | --- | 8.896 |
| $T_{min}$( -10ºC) | $V_{min}$(3.3)Vdc | 6.856 | 2 | --- | 8.856 |
| | $V_{max}$ (4.1) Vdc | 6.848 | 2 | --- | 8.848 |
| $T_{max}$( 45ºC) | $V_{min}$(3.3)Vdc | 6.917 | 2 | --- | 6.917 |
| | $V_{max}$ (4.1) Vdc | 6.902 | 2 | --- | 8.902 |
| Highest Channel- 2479MHz | | | | | |
| $T_{nom}$( 20 ºC) | $V_{nom}$(.3.7)Vdc | 6.892 | 2 | --- | 8.892 |
| $T_{min}$( -10ºC) | $V_{min}$(3.3)Vdc | 6.871 | 2 | --- | 8.871 |
| | $V_{max}$ (4.1) Vdc | 6.951 | 2 | --- | 8.951 |
| $T_{max}$( 45ºC) | $V_{min}$(3.3)Vdc | 6.865 | 2 | --- | 8.865 |
| | $V_{max}$ (4.1) Vdc | 6.828 | 2 | --- | 8.828 |

**For 802.11g**

| Test conditions | | RF Output Power | | | |
|---|---|---|---|---|---|
| | | **Measured power (dBm)** | **Antenna Gain (dBi)** | **Beamforming Gain ( dB)** | **E.I.R.P (dBm)** |
| Lowest Channel – 2412 MHz | | | | | |
| $T_{nom}$( 20 ºC) | $V_{nom}$(.3.7)Vdc | 5.741 | 2 | --- | 7.741 |
| $T_{min}$( -10ºC) | $V_{min}$(3.3)Vdc | 5.781 | 2 | --- | 7.781 |
| | $V_{max}$ (4.1) Vdc | 5.695 | 2 | --- | 7.695 |
| $T_{max}$( 45ºC) | $V_{min}$(3.3)Vdc | 5.763 | 2 | --- | 7.763 |
| | $V_{max}$ (4.1) Vdc | 5.769 | 2 | --- | 7.769 |
| Middle Channel – 2442 MHz | | | | | |
| $T_{nom}$( 20 ºC) | $V_{nom}$(.3.7)Vdc | 5.898 | 2 | --- | 7.898 |
| $T_{min}$( -10ºC) | $V_{min}$(3.3)Vdc | 5.805 | 2 | --- | 7.805 |
| | $V_{max}$ (4.1) Vdc | 5.887 | 2 | --- | 7.887 |
| $T_{max}$( 45ºC) | $V_{min}$(3.3)Vdc | 5.864 | 2 | --- | 7.864 |
| | $V_{max}$ (4.1) Vdc | 5.828 | 2 | --- | 7.828 |
| Highest Channel – 2472 MHz | | | | | |
| $T_{nom}$( 20 ºC) | $V_{nom}$(.3.7)Vdc | 5.832 | 2 | --- | 7.832 |
| $T_{min}$( -10ºC) | $V_{min}$(3.3)Vdc | 5.846 | 2 | --- | 7.846 |
| | $V_{max}$ (4.1) Vdc | 5.894 | 2 | --- | 7.894 |
| $T_{max}$( 45ºC) | $V_{min}$(3.3)Vdc | 5.847 | 2 | --- | 7.847 |
| | $V_{max}$ (4.1) Vdc | 5.839 | 2 | --- | 7.839 |

**For 802.11n HT20**

| Test conditions | | RF Output Power | | | |
|---|---|---|---|---|---|
| | | Measured power (dBm) | Antenna Gain (dBi) | Beamforming Gain ( dB) | E.I.R.P (dBm) |
| Lowest Channel – 2412 MHz | | | | | |
| $T_{nom}$( 20 ºC) | $V_{nom}$(.3.7)Vdc | 5.262 | 2 | --- | 7.262 |
| $T_{min}$( -10ºC) | $V_{min}$(3.3)Vdc | 5.257 | 2 | --- | 7.257 |
| | $V_{max}$ (4.1) Vdc | 5.205 | 2 | --- | 7.205 |
| $T_{max}$( 45ºC) | $V_{min}$(3.3)Vdc | 5.276 | 2 | --- | 5.276 |
| | $V_{max}$ (4.1) Vdc | 5.211 | 2 | --- | 7.211 |
| Middle Channel – 2442 MHz | | | | | |
| $T_{nom}$( 20 ºC) | $V_{nom}$(.3.7)Vdc | 5.111 | 2 | --- | 7.111 |
| $T_{min}$( -10ºC) | $V_{min}$(3.3)Vdc | 5.201 | 2 | --- | 7.201 |
| | $V_{max}$ (4.1) Vdc | 5.196 | 2 | --- | 7.196 |
| $T_{max}$( 45ºC) | $V_{min}$(3.3)Vdc | 5.174 | 2 | --- | 7.174 |
| | $V_{max}$ (4.1) Vdc | 5.158 | 2 | --- | 7.158 |
| Highest Channel – 2472 MHz | | | | | |
| $T_{nom}$( 20 ºC) | $V_{nom}$(.3.7)Vdc | 5.153 | 2 | --- | 7.153 |
| $T_{min}$( -10ºC) | $V_{min}$(3.3)Vdc | 5.196 | 2 | --- | 7.196 |
| | $V_{max}$ (4.1) Vdc | 5.167 | 2 | --- | 7.167 |
| $T_{max}$( 45ºC) | $V_{min}$(3.3)Vdc | 5.169 | 2 | --- | 7.169 |
| | $V_{max}$ (4.1) Vdc | 5.171 | 2 | --- | 7.171 |

**LIMITS** **EN 300328 Clause 4.3.1.1.2**

The adaptive equipment using wide band modulations other than FHSS, the maximum RF output power shall be 20dBm.The maximum RF output power for non-adaptive equipment shall be declared by the supplier and shall not exceed 20dBm. For non-adaptive equipment using wide band modulations other than FHSS, the maximum RF output power shall be equal to or less than the value declared by the supplier. This limit should apply for any combination of power level and intended antenna assembly.

**TRANSMITTER – DUTY CYCLE, Tx- SEQUENCE, Tx –GAP** **SUBCLAUSE 5.3.2**

## 1) FHSS Modulation

**Result** **N/A**

These requirements apply to non-adaptive frequency hopping equipment or to adaptive frequency hopping equipment operating in a non-adaptive mode.

These requirements do not apply for equipment with a maximum declared RF output power level of less than 10dBm e.i.r.p. or for equipment when operating in a mode where the RF output power is less than 10dBm e.i.r.p.

**Duty Cycle Calculation :**

**:**

**Maximum Tx-sequence time = Single burst on-time**

**= ( ≤ 5ms)**

**Minimum Tx- gap time = Single Tx off-time**

**= ( ≥ 5ms)**

**Duty cycle = total Tx on-time / observation period**

**=**

**Supplier declared duty cycle = %**

**LIMITS** **EN 300328 Clause 4.3.1.2.2**

For non-adaptive FHSS equipment, the Duty Cycle shall be equal to or less than the maximum value declared by the supplier, In addition, the maximum Tx-sequence time shall be 5ms while the minimum Tx-gap time shall be 5ms.

## 2) For Wide Band Modulation

**Result** **N.A.**

These requirements apply to non-adaptive equipment or to adaptive equipment when operating in a non-adaptive mode.

These requirements do not apply for equipment with a maximum declared RF output power level of less than 10dBm e.i.r.p. or for equipment when operating in a mode where the RF output power is less than 10dBm e.i.r.p.

**Duty Cycle Calculation :**

**Maximum Tx-sequence time = Single burst on-time**

**=**

**Minimum Tx- gap time = Single Tx off-time**

**=**

**Total observation period = 1s**

**Therefore duty cycle = total Tx on-time / observation period**

**=**

**Supplier declared duty cycle =**

Remark: Data graph is shown as the following page.

**LIMITS** **EN 300328 Clause 4.3.2.3.2**

The duty cycle shall be equal to or less than the maximum value declared by the supplier.

The maximum Tx-sequence Time and the minimum Tx-gap Time shall be according to the formula below:

Maximum Tx-sequence Time = Minimum Tx-gap Time = M

Where M is in the range of 3.5ms to 10ms.

## TRANSMITTER – MEDIUM UTILISATION (MU) SUBCLAUSE 5.3.2

**Result** **N/A**

This requirement does not apply to adaptive equipment unless operating in a non-adaptive mode.

In addition, this requirement does not apply for equipment with a maximum declared RF output power level of less than 10dBm e.i.r.p. or for equipment when operating in a mode where the RF output power is less than 10dBm e.i.r.p.

**LIMITS** **EN 300328 Clause 4.3.1.5.2 / 4.3.2.4.2**

The maximum Medium Utilisation factor for non-adaptive equipment shall be 10%.

## TRANSMITTER – POWER SPECTRAL DENSITY SUBCLAUSE 5.3.3

**Result** **PASS**

This testing is not applicable for the EUT using Frequency Hopping Spread Spectrum (FHSS) modulation.

**For Wide Band Modulation Only**

**Test result as below:**

**For IEEE 802.11b**

| Occupied Frequency Range | Max. e.i.r.p. Spectral Density (mW/MHz) |
|---|---|
| Lowest frequency | 1.20 |
| Middle frequency | 1.19 |
| Highest frequency | 1.20 |

**For IEEE802.11g**

| Occupied Frequency Range | Max. e.i.r.p. Spectral Density (mW/MHz) |
|---|---|
| Lowest frequency | 0.463 |
| Middle frequency | 0.458 |
| Highest frequency | 0.460 |

**For IEEE802.11n HT20**

| Occupied Frequency Range | Max. e.i.r.p. Spectral Density (mW/MHz) |
|---|---|
| Lowest frequency | 0.411 |
| Middle frequency | 0.401 |
| Highest frequency | 0.415 |

**LIMITS** **EN 300328 Clause 4.3.2.2.2**

For equipment using wide band modulations other then FHSS, the maximum power spectral density is limited to 10mW per MHz.

## TRANSMITTER – DWELL TIME, MINIMUM FREQUENCE OCCUPATION AND HOPPING SEQUENCE SUBCLAUSE 5.3.4

**Result** **N/A**

These requirements apply to all types of frequency hopping equipment.

**Measured Result:**

**LIMITS** **EN 300328 Clause 4.3.1.3.2**

**Non-adaptive frequency hopping systems**

The accumulated Dwell time on any hopping frequency shall not be greater than 15ms within any period of 15ms multiplied by the minimum number of hopping frequencies (N) that have to be used. Non-adaptive medical devices requiring reverse compatibility with other medical devices placed on the market when earlier versions of the present document were harmonised, are allowed to have any operating mode in which the maximum dwell time is 400ms.

The hopping sequence(s) shall contain at least N hopping frequencies where N is 15 or 15 divided by the minimum Hopping Frequency Separation in MHz, whichever is the greater.

The Minimum Frequency Occupation Time shall be equal to one dwell time within a period not exceeding four times the product of the dwell time per hop and the number of hopping frequencies in use.

**Adaptive frequency hopping systems**

Adaptive Frequency Hopping systems shall be capable of operating over a minimum of 70% of the band specified in clause 1.

The maximum accumulated dwell time on any hopping frequency shall be 400ms within any period of 400ms multiplied by the minimum number of hopping frequencies (N) that have to be used.

The hopping sequence(S) shall contain at least N hopping frequencies at all times, where N is 15 or 15 divided by the minimum Hopping Frequency Separation in MHz, whichever is the greater. The Minimum Frequency Occupation Time shall be equal to one dwell time within a period not exceeding four times the product of the dwell time per hop and the number of hopping frequencies in use.

## TRANSMITTER – HOPPING FREQUENCY SEPARATION SUBCLAUSE 5.3.5

**Result** **N/A**

These requirements apply to all types of frequency hopping equipment.

**LIMITS** **EN 300328 Clause 4.3.1.4.2**

**Non-adaptive frequency hopping systems**

The minimum Hopping Frequency Separation shall be equal to Occupied Channel Bandwidth of a single lop, with a minimum separation of 100kHz.

**Adaptive frequency hopping systems**

The minimum Hopping Frequency Separation shall be 100 kHz.

## TRANSMITTER – ADAPTIVITY (CHANNEL ACCESS MECHANISM) SUBCLAUSE 5.3.7

## 1) Adaptive Frequency Hopping

**Result** **N.A.**

This requirement does not apply to non-adaptive equipment or adaptive equipment operating in a non-adaptive mode providing the equipment complies with the requirements and/or restrictions applicable to non-adaptive equipment.

In addition, this requirement does not apply for equipment with a maximum declared RF output power level of less than 10dBm e.i.r.p. or for equipment when operating in a mode where the RF output power is less than 10dBm e.i.r.p.

**Test Result of using LBT based DAA :**

| Test Item | Limit | Measured Value | Result |
|---|---|---|---|
| Clear Channel Assessment (CCA) | > 0.2% * COT with min. 20us | | n.a |
| Channel Occupancy Time (COT) | < 60ms | | n.a |
| Idle Period | > 5% * COT with min. 100us | | n.a |
| Unavailable Channels | No transmission | Yes | n.a |
| | > 15 hopping frequencies are maintained | | n.a |
| Detection Threshold Level (TL) | -70dBm/MHz for 20dBm e.i.r.p | | n.a |
| | -70dBm/MHz +20- Pout e.i.r.p for power below 20dBm | | n.a |
| Short Control Signalling Transmissions | Max 10% of duty cycle within 50ms or dwell time, whichever is shorter. | | n.a |

**Test Result of using other forms of DAA ( non-LBT based) :**

| Test Item | Limit | Measured Value | Result |
|---|---|---|---|
| Channel Occupancy Time (COT) | < 40ms | | n.a |
| Min time for Unavailable Hopping Frequency | ≥ 1s or 5 * COT | | n.a |
| Unavailable Channels | No Transmission | Yes | n.a |
| | > 15 hopping frequencies are maintained | | n.a |
| Idle Period of EUT with dwell time ≥ 40ms | > 5% * COT with min. 100us | | n.a |
| Detection Threshold Level (TL) | -70dBm/MHz for 20dBm e.i.r.p | | n.a |
| | -70dBm/MHz +20- Pout e.i.r.p for power below 20dBm | | n.a |
| Short Control Signalling Transmissions | Max 10% of duty cycle within 50ms or dwell time, whichever is shorter. | | n.a |

## 2) Adaptive Equipment using modulations other than FHSS

**Result** **N/A**

This requirement does not apply to non-adaptive equipment or adaptive equipment operating in a non-adaptive mode providing the equipment complies with the requirements and/or restrictions applicable to non-adaptive equipment.

In addition, this requirement does not apply for equipment with a maximum declared RF output power level of less than 10dBm e.i.r.p. or for equipment when operating in a mode where the RF output power is less than 10dBm e.i.r.p.

**Test Result of using Non- LBT based DAA :**

| Test Item | Limit | Measured Value | Result |
|---|---|---|---|
| Clear Channel Assessment (CCA) | 20us | | n.a |
| Channel Occupancy Time (COT) | 1ms ~ 10ms | | n.a |
| Idle Period | > 5% * OCT | | n.a |
| Detection Threshold Level (TL) | -70dBm/MHz for 20dBm e.i.r.p | | n.a |
| | -70dBm/MHz +20- Pout e.i.r.p for power below 20dBm | | n.a |
| Short Control Signalling Transmissions | Max 10% of duty cycle within 50ms | | n.a |

**Test Result of using LBT based DAA :**

| Test Item | Limit | Measured Value | Result |
|---|---|---|---|
| Clear Channel Assessment (CCA) | 20us | | n.a |
| Channel Occupancy Time (COT) | 1ms ~ 10ms | | n.a |
| Idle Period | > 5% * OCT | | n.a |
| Detection Threshold Level (TL) | -70dBm/MHz for 20dBm e.i.r.p | | n.a |
| | -70dBm/MHz +20- Pout e.i.r.p for power below 20dBm | | n.a |
| Short Control Signalling Transmissions | Max 10% of duty cycle within 50ms | | n.a |

## TRANSMITTER –OCCUPIED CHANNEL BANDWIDTH SUBCLAUSE 5.3.8

## 1) FHSS Modulation

**Result** **N/A**

The occupied channel bandwidth is the bandwidth that contains 99% of the power of the signal.

The measurement shall be performed on the lowest and highest frequency, and if EUT has different occupied channel bandwidth, then all channel bandwidth shall be tested separately.

Testing was carried out under normal test condition.

| Test Mode | Occupied Frequency Range | |
|---|---|---|
| | Fl (MHz) | Fh (MHz) |
| **Adaptive FHSS** | | |
| --- | --- | --- |
| Limit | 2400 | 2483.5 |
| **Non-adaptive FHSS** | | |
| **Test Mode** | **Fl (MHz)** | **Fh (MHz)** |
| --- | --- | --- |
| --- | --- | --- |
| Limit | 2400 | 2483.5 |
| | | |
| Measured Channel BW ( MHz ) | --- | --- |
| Declared BW (MHz) | --- | |
| Measurement uncertainty (dB) | $< \pm 1*10^{-7}$ | |

**LIMITS** **EN 300328 Clause 4.3.1.7**

The occupied channel bandwidth for each hopping frequency shall fall completely within 2.4GHz to 2.4835 GHz.

For non-adaptive frequency hopping equipment with e.i.r.p greater than 10dBm, the occupied channel bandwidth for every occupied hopping frequency shall be equal to or less than the value declared by the supplier. This declared value shall not be greater than 5 MHz.

## 2) For Wide Band Modulation

**Result** **PASS**

The occupied channel bandwidth is the bandwidth that contains 99% of the power of the signal.

**For IEEE 802.11b**

| Test Mode | Occupied Frequency Range | |
|---|---|---|
| | Fl (MHz) | Fh (MHz) |
| **Adaptive** | | |
| DSSS | 2403.85 | 2480.02 |
| Limit | 2400 | 2483.5 |
| **Non-adaptive** | | |
| **Test Mode** | **Fl (MHz)** | **Fh (MHz)** |
| --- | --- | --- |
| --- | --- | --- |
| Limit | 2400 | 2483.5 |
| | | |
| Measured Channel BW ( MHz ) | 16.068 | 15.982 |
| Declared BW (MHz) | --- | |

**For IEEE 802.11g**

| Test Mode | Occupied Frequency Range | |
|---|---|---|
| | Fl (MHz) | Fh (MHz) |
| **Adaptive** | | |
| OFDM | 2403.68 | 2480.35 |
| Limit | 2400 | 2483.5 |
| **Non-adaptive** | | |
| **Test Mode** | **Fl (MHz)** | **Fh (MHz)** |
| --- | --- | --- |
| --- | --- | --- |
| Limit | 2400 | 2483.5 |
| | | |
| Measured Channel BW ( MHz ) | 16.605 | 16.596 |
| Declared BW (MHz) | --- | |

**For 802.11n HT20**

| Test Mode | Occupied Frequency Range | |
|---|---|---|
| | Fl (MHz) | Fh (MHz) |
| **Adaptive** | | |
| OFDM | 2403.25 | 2480.75 |
| Limit | 2400 | 2483.5 |
| **Non-adaptive** | | |
| **Test Mode** | **Fl (MHz)** | **Fh (MHz)** |
| --- | --- | --- |
| --- | --- | --- |
| Limit | 2400 | 2483.5 |
| | | |
| Measured Channel BW ( MHz ) | 17.455 | 17.521 |
| Declared BW (MHz) | --- | |

**LIMITS** **EN 300328 Clause 4.3.2.6.2**

The occupied channel bandwidth for each hopping frequency shall fall completely within 2.4GHz to 2.4835 GHz.

In addition, for non-adaptive systems using wide band modulations other than FHSS and with e.i.r.p greater than 10 dBm, the occupied channel bandwidth shall be less than 20 MHz.

## TRANSMITTER – TRANSMITTER UNWANTED EMISSIONS IN THE OUT-OF-BAND DOMAIN SUBCLAUSE 5.3.9

**Result** **PASS**

Spectrum Analyser Bandwidth: RBW =1MHz; VBW=3MHz
Span =0Hz; Sweep points =5000
Operation Mode of EUT: normal operating

**For 802.11b (Worst Case)**

| Test Conditions | Test CH. | Test Segment MHz | Max. Reading dBm/MHz | Limit dBm/MHz | Result |
|---|---|---|---|---|---|
| $T_{nor}$ (20ºC); $V_{nor}$ (5.0V) | Lowest | 2400-BW to 2400 | -24.52 | -10 | Pass |
| | | 2400-2BW to 2400-BW | -40.15 | -20 | Pass |
| | Highest | 2483.5 to 2483.5+BW | -33.89 | -10 | Pass |
| | | 2483.5+BW to 2483.5+2BW | -43.54 | -20 | Pass |
| $T_{min}$ (-10 ºC); $V_{min}$ (4.5V) | Lowest | 2400-BW to 2400 | -24.41 | -10 | Pass |
| | | 2400-2BW to 2400-BW | -40.24 | -20 | Pass |
| | Highest | 2483.5 to 2483.5+BW | -33.91 | -10 | Pass |
| | | 2483.5+BW to 2483.5+2BW | -43.63 | -20 | Pass |
| $T_{min}$ (-10 ºC); $V_{max}$ (5.5V) | Lowest | 2400-BW to 2400 | -24.39 | -10 | Pass |
| | | 2400-2BW to 2400-BW | -40.08 | -20 | Pass |
| | Highest | 2483.5 to 2483.5+BW | -33.96 | -10 | Pass |
| | | 2483.5+BW to 2483.5+2BW | -43.91 | -20 | Pass |
| $T_{max}$ ( 45ºC); $V_{min}$ ( 4.5V) | Lowest | 2400-BW to 2400 | -24.82 | -10 | Pass |
| | | 2400-2BW to 2400-BW | -40.15 | -20 | Pass |
| | Highest | 2483.5 to 2483.5+BW | -33.87 | -10 | Pass |
| | | 2483.5+BW to 2483.5+2BW | -43.79 | -20 | Pass |
| $T_{max}$ (45 ºC); $V_{max}$ (5.5V) | Lowest | 2400-BW to 2400 | -24.73 | -10 | Pass |
| | | 2400-2BW to 2400-BW | -40.26 | -20 | Pass |
| | Highest | 2483.5 to 2483.5+BW | -33.92 | -10 | Pass |
| | | 2483.5+BW to 2483.5+2BW | -43.62 | -20 | Pass |
| Note: BW = 1 MHz | | | | | |


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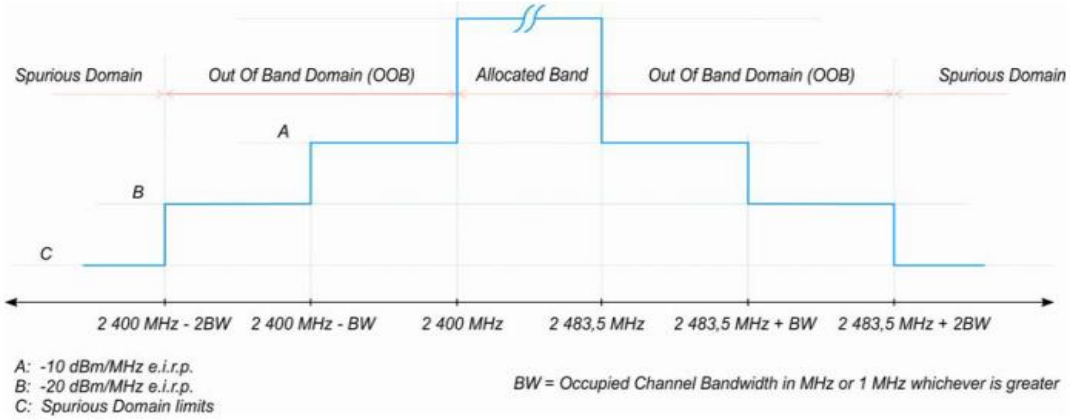
**LIMITS** **EN 300328 Clause 4.3.1.8.2 / 4.3.2.7.2**

The transmitter unwanted emissions in the out-of –band domain but outside the allocated band, shall not exceed the values provided by the mask. Within 2400MHz to 2483.5MHz band, the out-of-band emissions are fulfilled by compliance with the occupied channel bandwidth requirement in clause 4.3.1.7 or 4.3.2.6





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## TRANSMITTER – TRANSMITTER UNWANTED EMISSIONS IN THE SPURIOUS DOMAIN SUBCLAUSE 5.3.10

**Result** **PASS**

Spectrum Analyser Bandwidth: For testing range 30MHz to 1000MHz, RBW =100KHz ; VBW=300KHz
For testing range over 1000MHz, RBW =1MHz ; VBW=3MHz

Operation Mode of EUT: continuously transmitting mode

For IEEE802.11b (Worst Case)

| Operating Mode | | |
|---|---|---|
| **Frequency (MHz)** | **Spurious emissions level (dBm)** | **Limit (dBm)** |
| **Lowest Channel** | | |
| 4824.00 | -38.72 | -30.0 |
| 7236.00 | -41.02 | -30.0 |
| **Highest Channel** | | |
| 4944.00 | -39.05 | -30.0 |
| 7416.00 | -40.75 | -30.0 |
| **Standby Mode** | | |
| **Frequency (MHz)** | **Polarization** | **Spurious emissions level (dBm)** |
| No | Peak | Found |

**LIMITS** **EN 300328 Clause 4.3.1.9.2 / 4.3.2.8.2**

The transmitter unwanted emissions in the spurious domain shall not exceed the values given in the following table.

| Frequency range | Maximum power, e.r.p. (≤ 1 GHz) e.i.r.p. (> 1 GHz) | Bandwidth |
|---|---|---|
| 30 MHz to 47 MHz | -36 dBm | 100 kHz |
| 47 MHz to 74 MHz | -54 dBm | 100 kHz |
| 74 MHz to 87,5 MHz | -36 dBm | 100 kHz |
| 87,5 MHz to 118 MHz | -54 dBm | 100 kHz |
| 118 MHz to 174 MHz | -36 dBm | 100 kHz |
| 174 MHz to 230 MHz | -54 dBm | 100 kHz |
| 230 MHz to 470 MHz | -36 dBm | 100 kHz |
| 470 MHz to 862 MHz | -54 dBm | 100 kHz |
| 862 MHz to 1 GHz | -36 dBm | 100 kHz |
| 1 GHz to 12,75 GHz | -30 dBm | 1 MHz |

## RECEIVER – RECEIVER SPURIOUS EMISSIONS SUBCLAUSE 5.3.11

**Result** **PASS**

Spectrum Analyser Bandwidth: For testing range 30MHz to 1000MHz, RBW =100KHz; VBW=300KHz
For testing range over 1000MHz, RBW =1MHz; VBW=3MHz

Operation Mode of EUT: Signal receiving mode

**For 802.11b/g/nHT20**

| Operating Mode | | |
|---|---|---|
| **Frequency (MHz)** | **Polarization** | **Spurious Emissions Level (dBm)** |
| No | Peak | Found |
| --- | --- | --- |

**LIMITS** **EN 300328 Clause 4.3.1.9.2 / 4.3.2.9.2**

The spurious emissions of the receiver shall not exceed the values given in the following table.

| Receiver limits for narrowband spurious emissions | | |
|---|---|---|
| **Frequency Range** | **Maximum power e.r.p. (≤ 1GHz)**<br>**e.i.r.p. ( >1GHz)** | **Measurement bandwidth** |
| **30 MHZ to 1 GHz** | -57 dBm | 100kHz |
| **1 GHz to 12.75 GHz** | -47 dBm | 1MHz |

# Restrictions for Human Exposure to EM Fields - EN 62311:2008

**HUMAN EXPOSURE TO RADIO FREQUENCY ELECTROMAGNETIC SUBCLAUSE 6**

**Result PASS**

**IEEE 802.11b**

| Channel Frequency (MHz) | Output Power to Antenna (dBm) | Output Power to Antenna (mW) | E-field Strength (V/m) | E-field Strength Limit (V/m) | PASS/ FAIL |
|---|---|---|---|---|---|
| 2412 | 8.989 | 7.92 | 2.44 | 61 | PASS |
| 2442 | 8.917 | 7.79 | 2.42 | 61 | PASS |
| 2462 | 8.951 | 7.85 | 2.43 | 61 | PASS |

**IEEE 802.11g**

| Channel Frequency (MHz) | Output Power to Antenna (dBm) | Output Power to Antenna (mW) | E-field Strength (V/m) | E-field Strength Limit (V/m) | PASS/ FAIL |
|---|---|---|---|---|---|
| 2412 | 7.781 | 6.00 | 2.12 | 61 | PASS |
| 2442 | 7.898 | 6.16 | 2.15 | 61 | PASS |
| 2462 | 7.940 | 6.22 | 2.16 | 61 | PASS |

**IEEE 802.11n HT20**

| Channel Frequency (MHz) | Output Power to Antenna (dBm) | Output Power to Antenna (mW) | E-field Strength (V/m) | E-field Strength Limit (V/m) | PASS/ FAIL |
|---|---|---|---|---|---|
| 2412 | 7.276 | 5.34 | 2.00 | 61 | PASS |
| 2442 | 7.201 | 5.25 | 1.98 | 61 | PASS |
| 2462 | 7.176 | 5.22 | 1.98 | 61 | PASS |

## Limit

According to the EN 62311: 2008, the criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified 1999/519/EC.

Reference levels of electric, magnetic, and electromagnetic fields (0MHz to 300GHz, unperturbed RMS values)

| Frequency range | E-field strength (V/m) | H-field strength (∧/m) | B-field (nT) | Equivalent plane wave power density SEq (W/m2) |
|---|---|---|---|---|
| 0-1Hz | — | 3.2X104 | 4X104 | — |
| 1-8Hz | 10000 | 3.2X104/f2 | 4X104/f | — |
| 8-25Hz | 10000 | 4000/f | 5000/f | — |
| 0.025-0.8kHz | 250/f | 4/f | 5/f | — |
| 0.8-3kHz | 250/f | 5 | 6.25 | — |
| 3-150kHz | 87 | 5 | 6.25 | — |
| 0.15-1MHz | 87 | 0.73/f | 0.92/f | — |
| 1-10MHz | 87/f | 0.73/f | 0.92/f | — |
| 10-400MHz | 28 | 0.073 | 0.092 | 2 |
| 400-2000MHz | 1,375/f | 0.0073 | 0.0046 | f/200 |
| 2-300GHz | 61 | 0.16 | 0.20 | 10 |

Note:
1. f as indicated in the frequency range column
2. For frequencies between 100 kHz and 10 GHz, SEq, E2, H2, and B2 are to be averaged over any sixty-minute period.
3. For frequencies exceeding 10GHz, SEq, E2, H2, and B2 are to be averaged over any 68/f1.05-minute period (f in GHz).
4. No E-field value is provided for frequencies<1 Hz, which are effectively static electric fields. For most people the annoying perception of surface electric charges will not occur at field strengths less than 25 kV/m, Spark discharges causing stress or annoyance should be avoided.

## Classification of the Assessment Methods

The antenna of the product, under normal use condition is at least 20 cm away from the body of the user. Warning statement to the user to keeping at least 20 cm separation distance and the prohibition of operating to a person has been printed on the user´s manual. So, this product under normal use is located on electromagnetic far field between the human body.

Far Field Calculation Formula

$$E = \frac{\sqrt{30\,PG(\theta,\phi)}}{r} \quad \text{rj0H} =$$

G=antenna gain relative to an isotropic antenna
$\theta$ ,Ø=elevation and azimuth angles to point of investigation
r=distance from observation point to the antenna
ŋ0=Characteristic impedance of free space

# LIST OF TEST REQUIPMENTS

To simplify the identification of the test equipments used on each testing, test equipments and ancillaries are numbered as below and listed at the relative page of test report.

| Ref No. | Kind of Equipment | Manufacturer | Type | S/N | Due Date |
|---|---|---|---|---|---|
| 01 | MXG X-Series Vector Signal Generator | Aglient | N5182B | MY53050647 | Mar 19 2015 |
| 02 | EXA Signal Analyzer | Aglient | N9010A | MY53470504 | Mar 19 2015 |
| 03 | RF Analog Signal Generator | Aglient | N5171B | MY53050474 | Mar 19 2015 |
| 04 | USB Wideband Power Sensor | Aglient | U2021XA | MY54110009 | Mar 19 2015 |
| 05 | USB Wideband Power Sensor | Aglient | U2021XA | MY54110014 | Mar 19 2015 |
| 06 | USB Wideband Power Sensor | Aglient | U2021XA | MY54110013 | Mar 19 2015 |
| 07 | USB Wideband Power Sensor | Aglient | U2021XA | MY54110007 | Mar 19 2015 |
| 08 | Temperature and Humidity Chamber | XingBao | XB1212 | N/A | Jan. 20 2015 |
| 09 | DC Power Supply | LongTon | S12 | 1S3105 | Jul. 16 2015 |

| Subclause | Test Items | Test Equipment Items No. |
|---|---|---|
| **TRANSMITTER PARAMETER** | | |
| 4.3.1.1 | RF output power | 01,02,03,04,05,06,07,08,09 |
| 4.3.1.2 | Duty Cycle, Tx-sequence, Tx-gap | 01,02,03,04,05,06,07 |
| 4.3.1.3 | Dwell time, Minimum Frequency Occupation and Hopping Sequence | 01,02,03,04,05,06,07 |
| 4.3.1.4 | Hopping Frequency Separation | 01,02,03,04,05,06,07 |
| 4.3.1.5 | Medium Utilisation (MU) factor | 01,02,03,04,05,06,07 |
| 4.3.1.6 | Adaptivity (Adaptive Frequency Hopping) | 01,02,03,04,05,06,07 |
| 4.3.1.7 | Occupied Channel Bandwidth | 01,02,03,04,05,06,07 |
| 4.3.1.8 | Transmitter unwanted emissions in the out-of-band domain | 01,02,03,04,05,06,07,08,09 |
| 4.3.1.9 | Transmitter unwanted emissions in the spurious domain | 01,02,03,04,05,06,07 |
| | | |
| **RECEIVER PARAMETER** | | |
| 4.3.1.10 | Receiver spurious emissions | 01,02,03,04,05,06,07 |
| | | |


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# APPENIDX- PHOTOS OF EUT


**Whole Part(I.R.I.S)**


IRIScan™ Mouse Wifi




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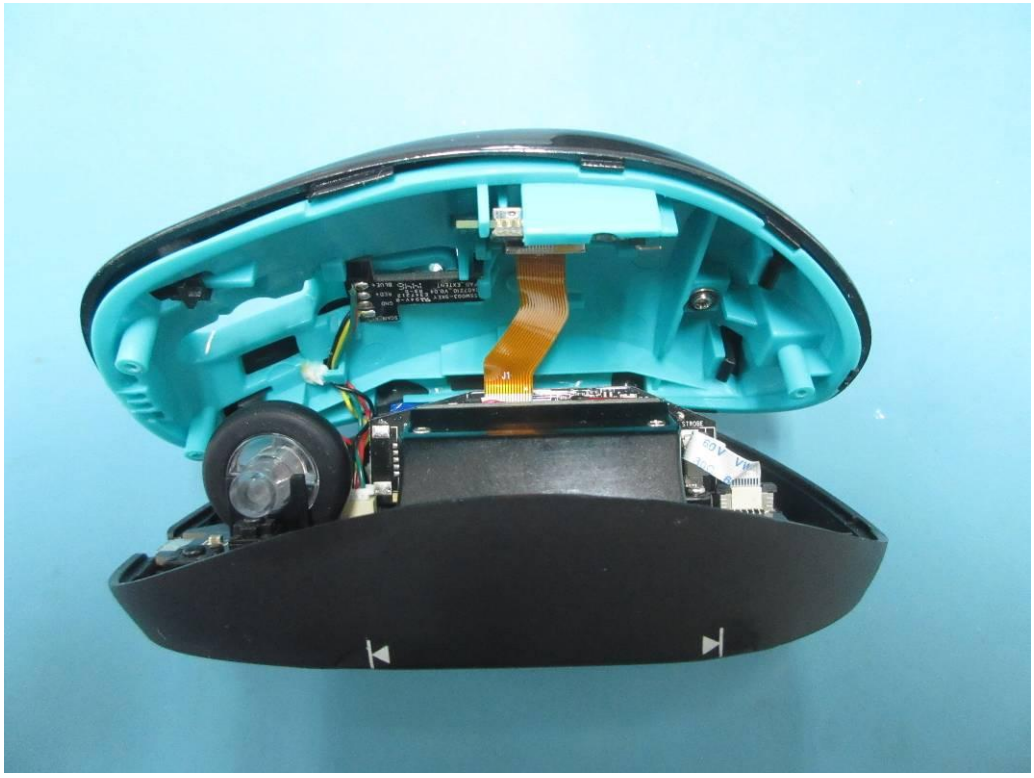
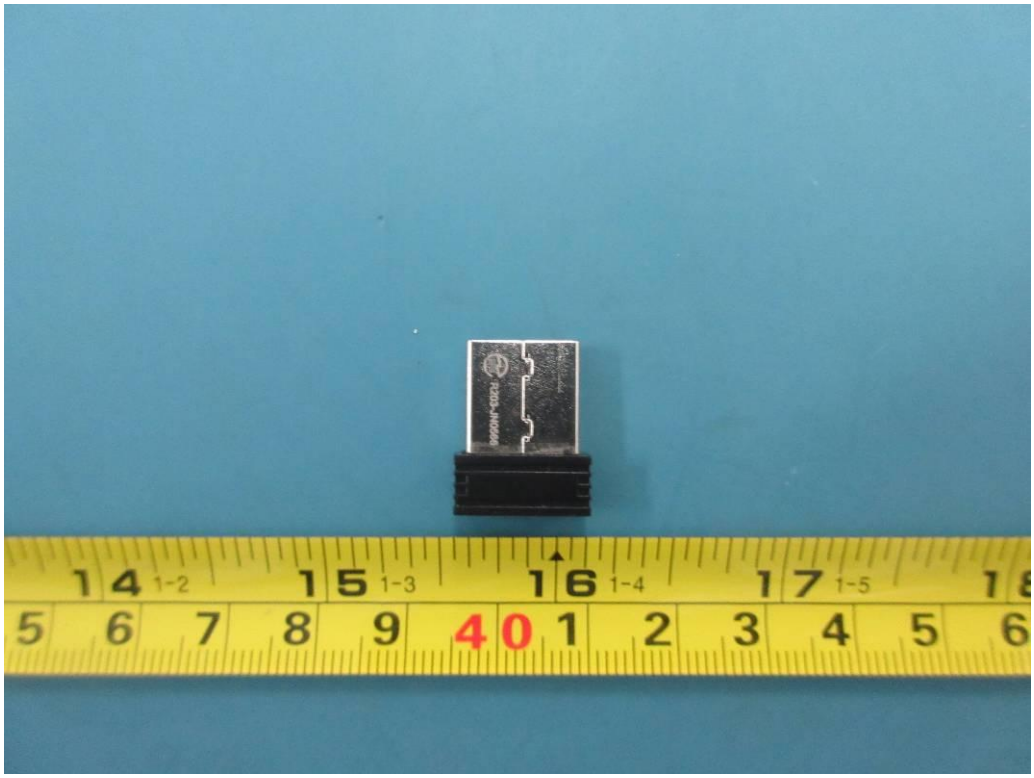
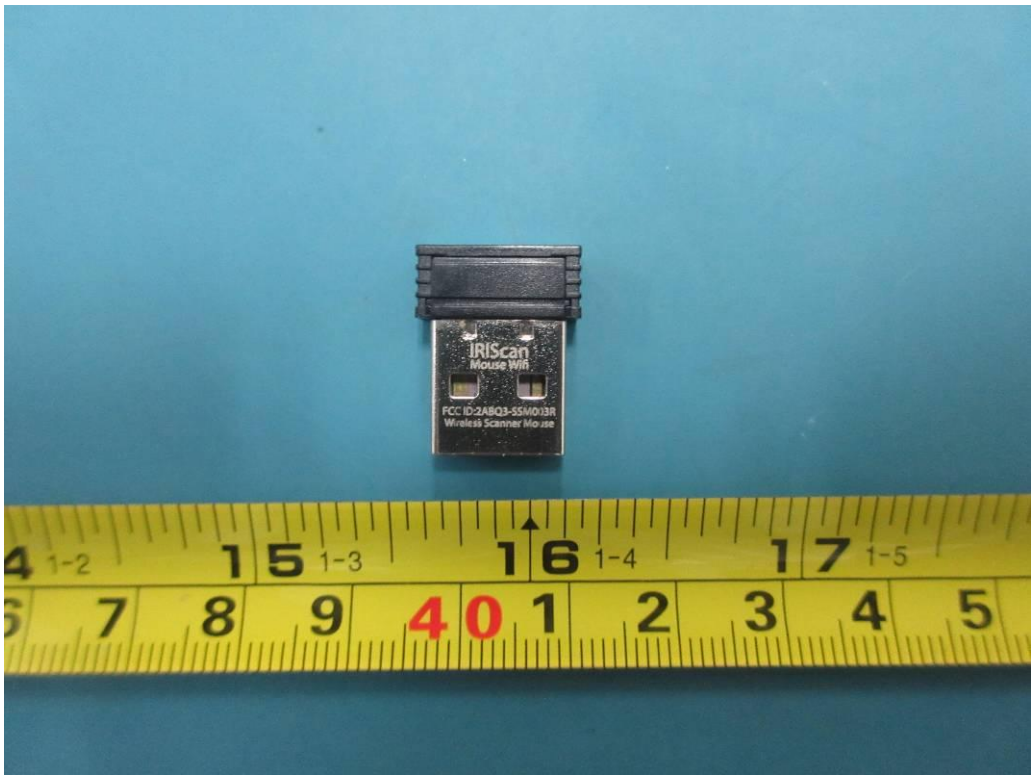
IRIScan™ Mouse Wifi









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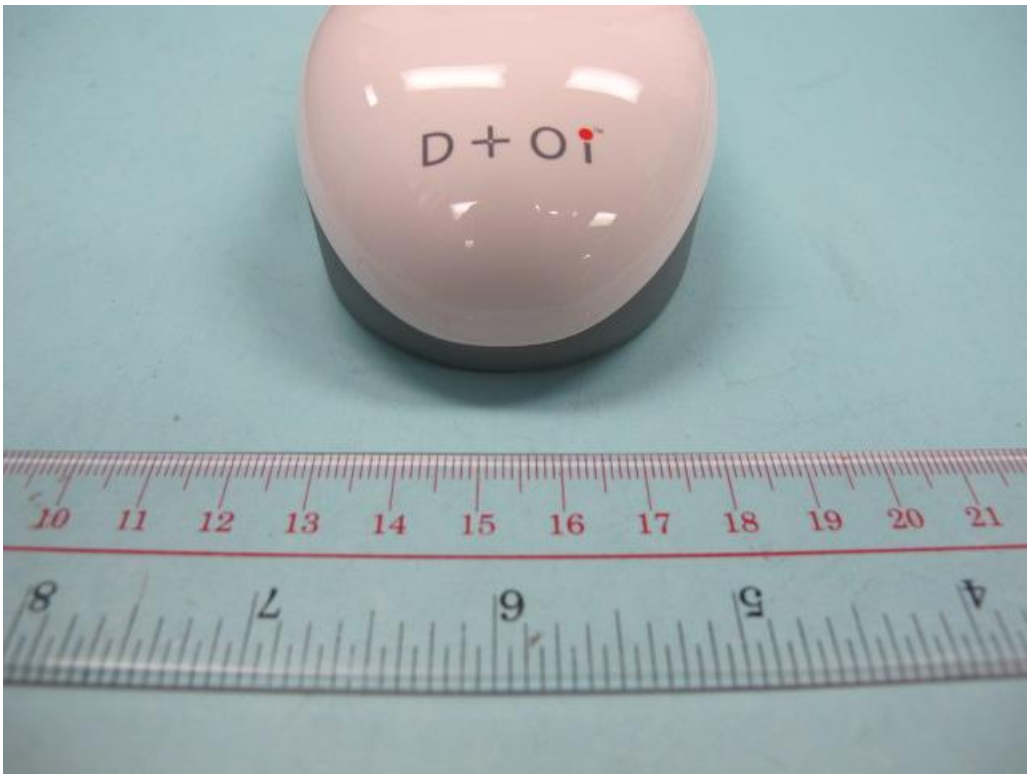
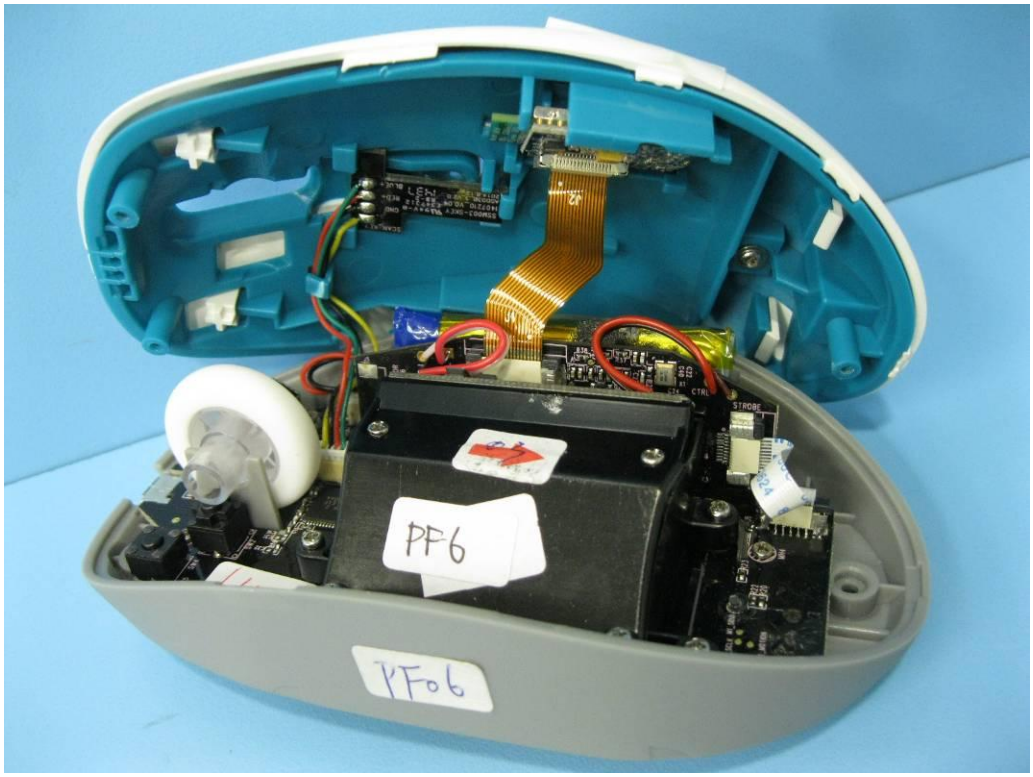
IRIScan™
Mouse Wifi


**Whole Part(System)**


zcan


zcan

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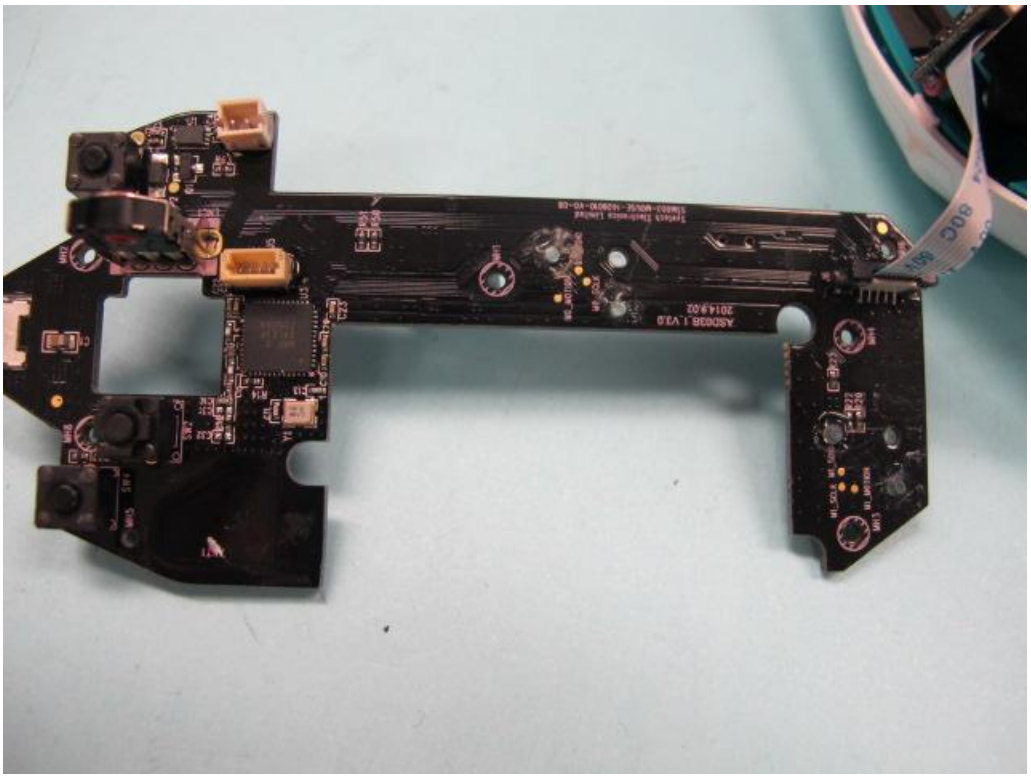

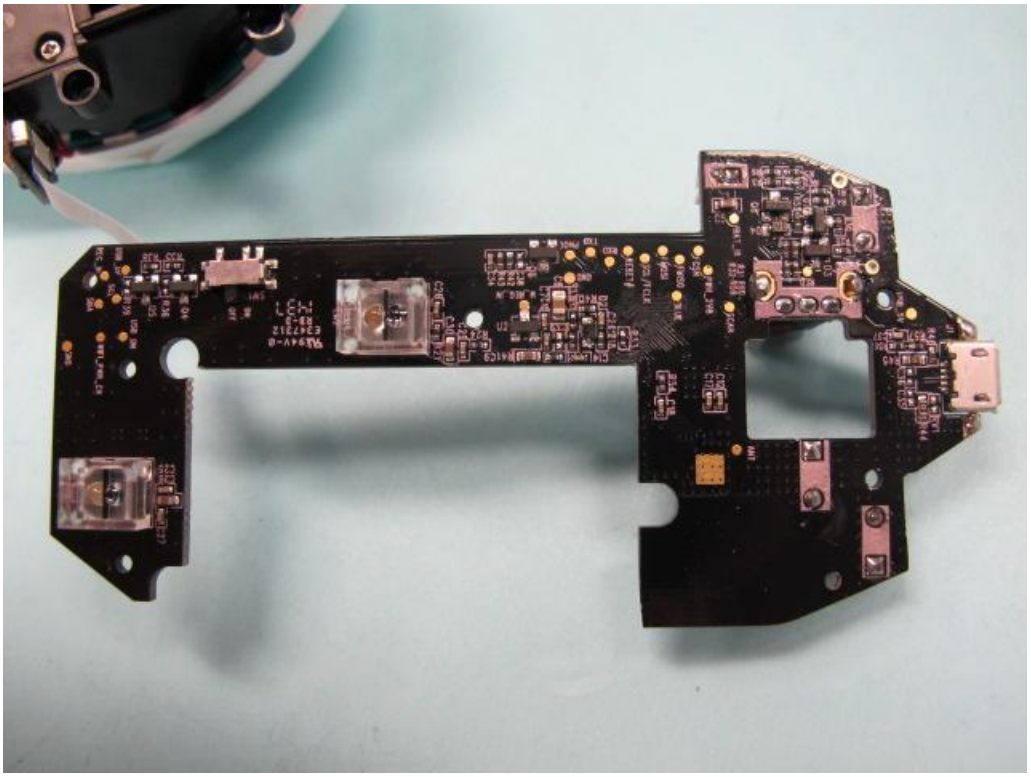


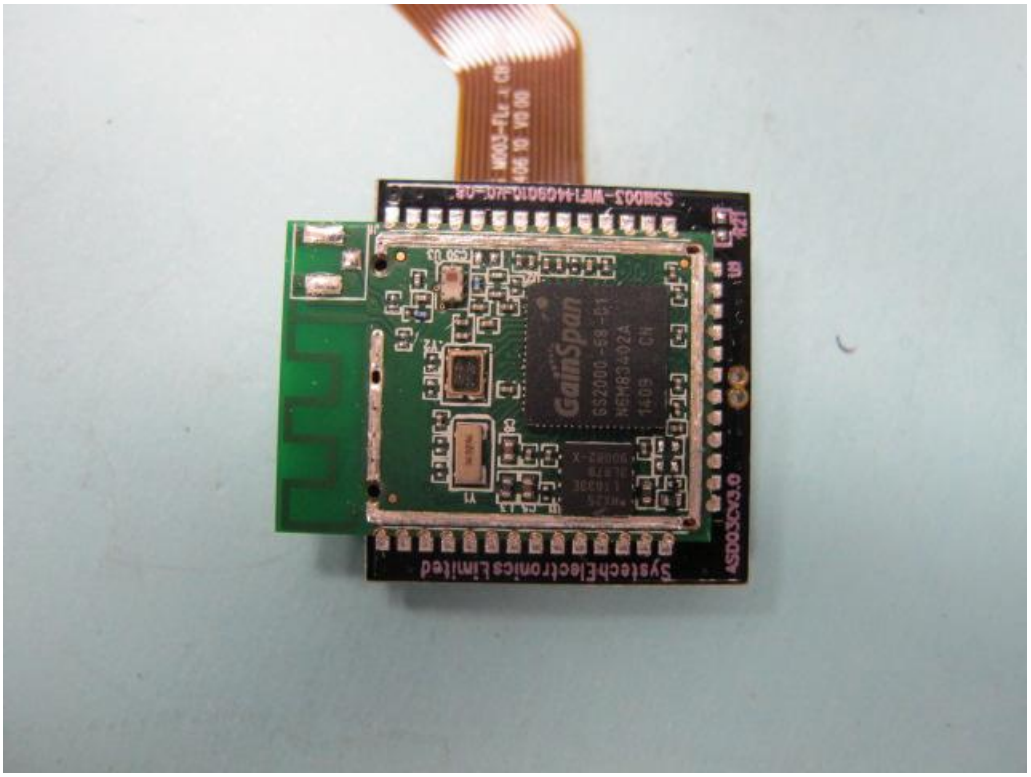



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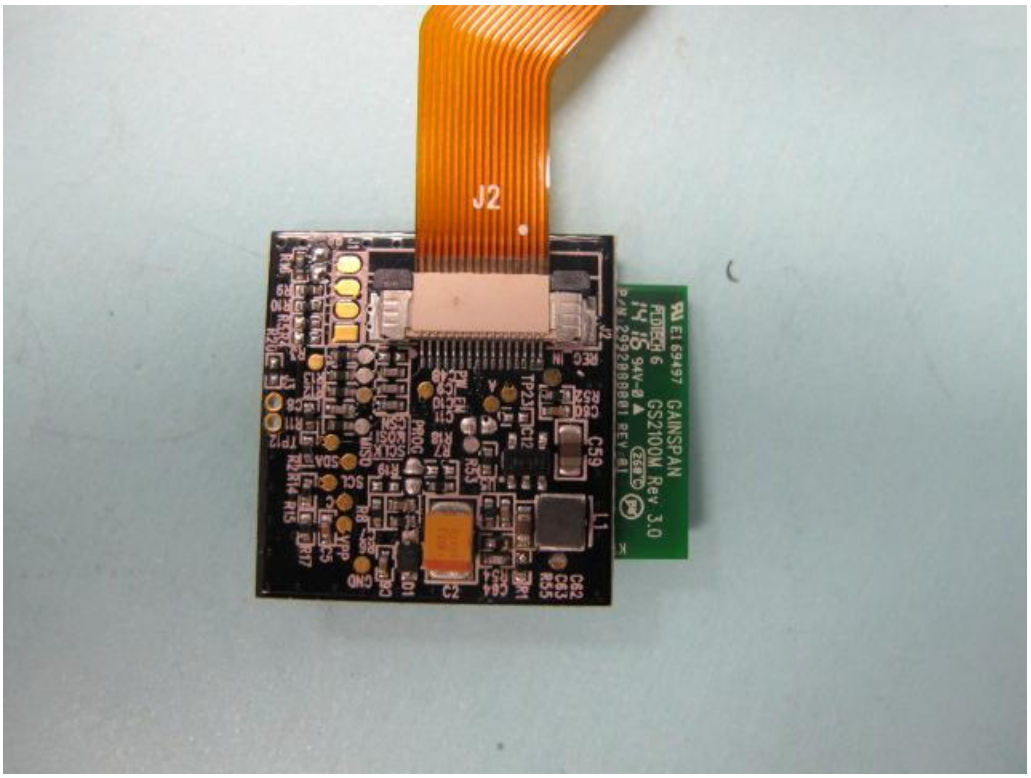


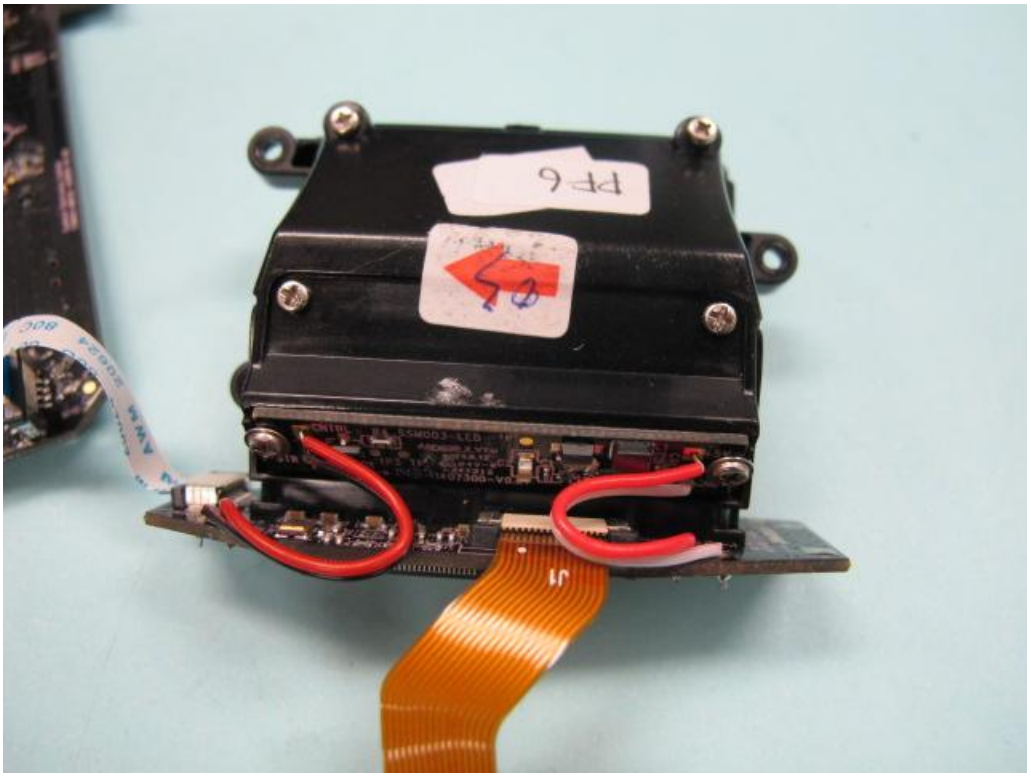


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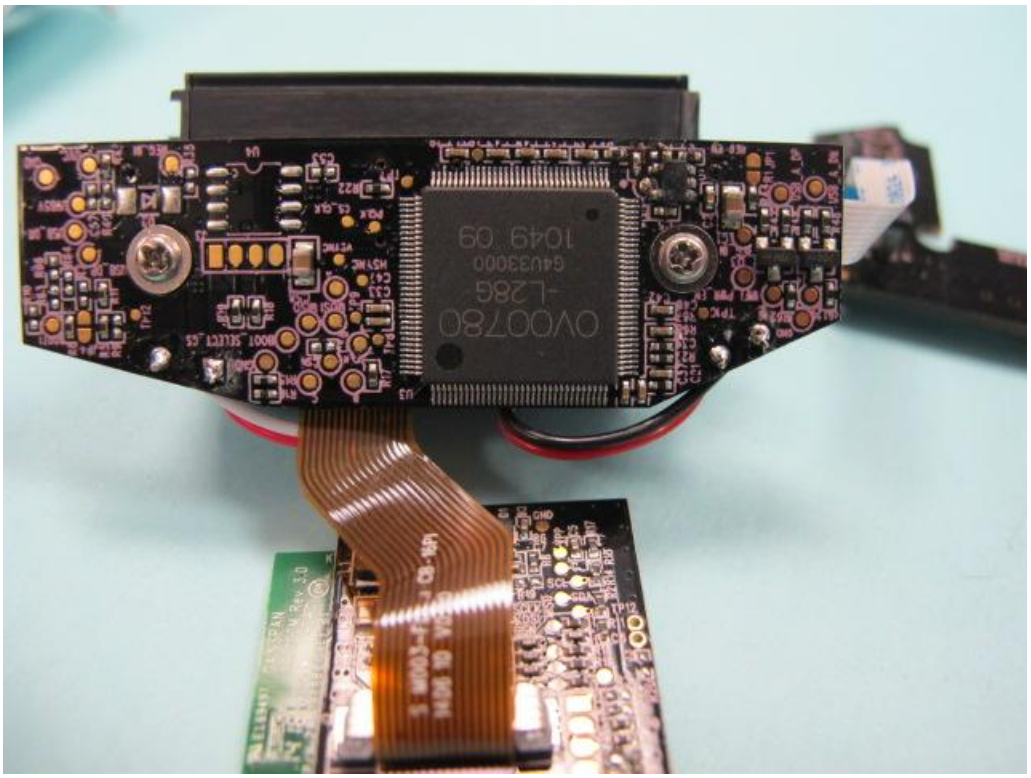
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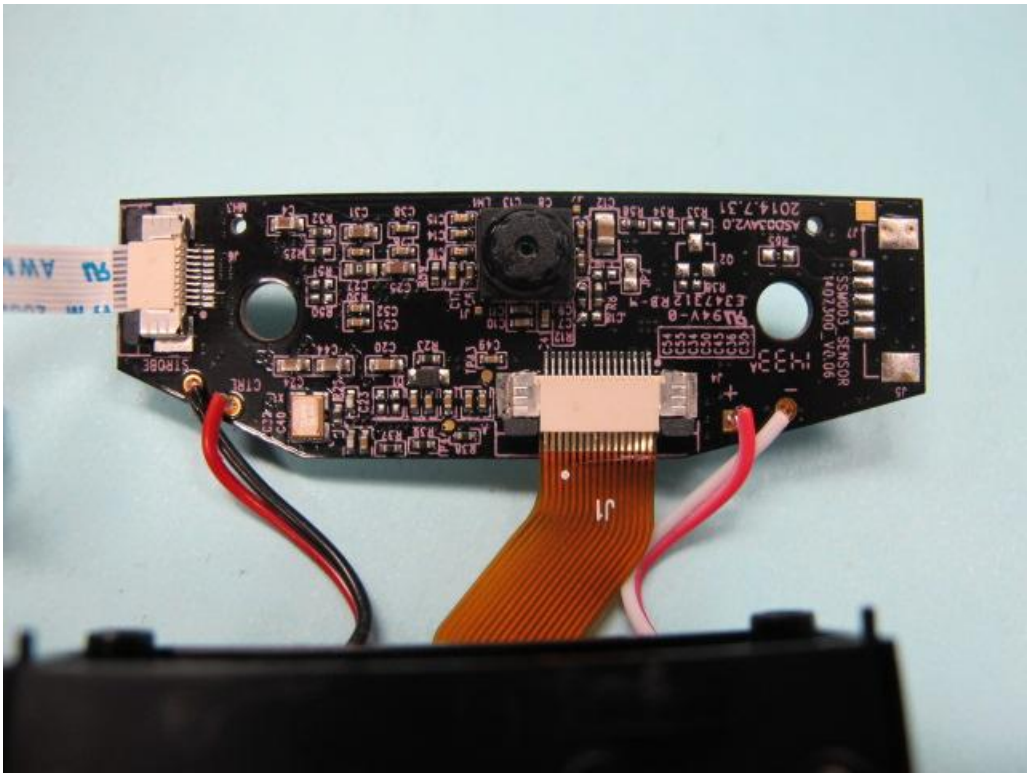

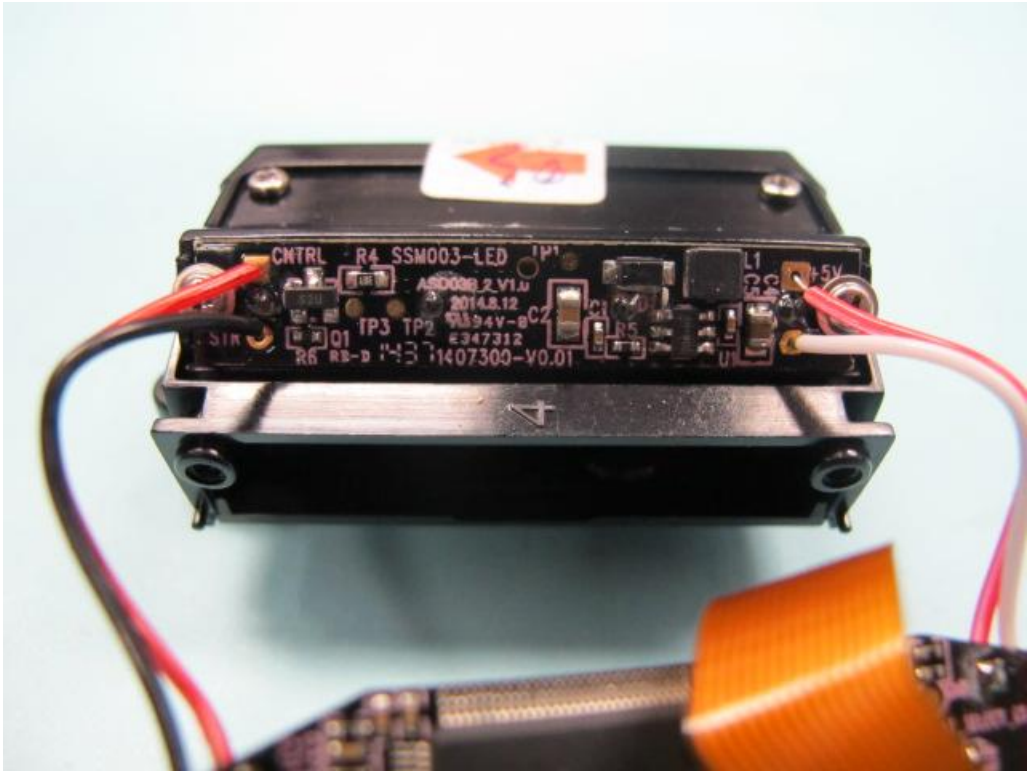


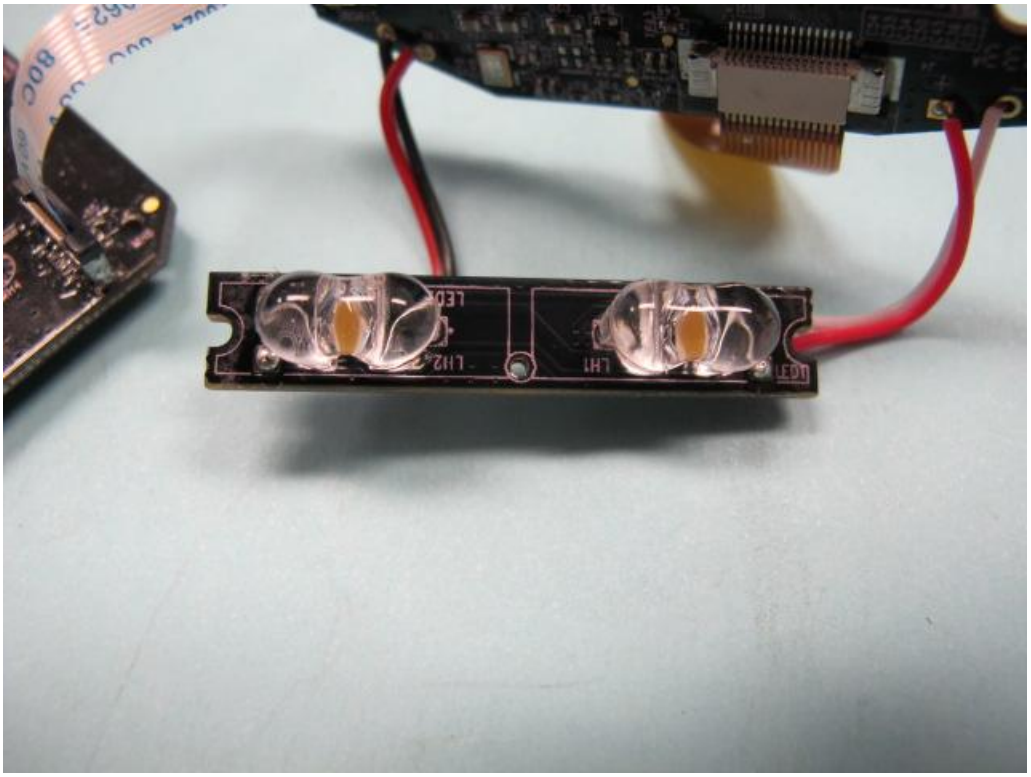


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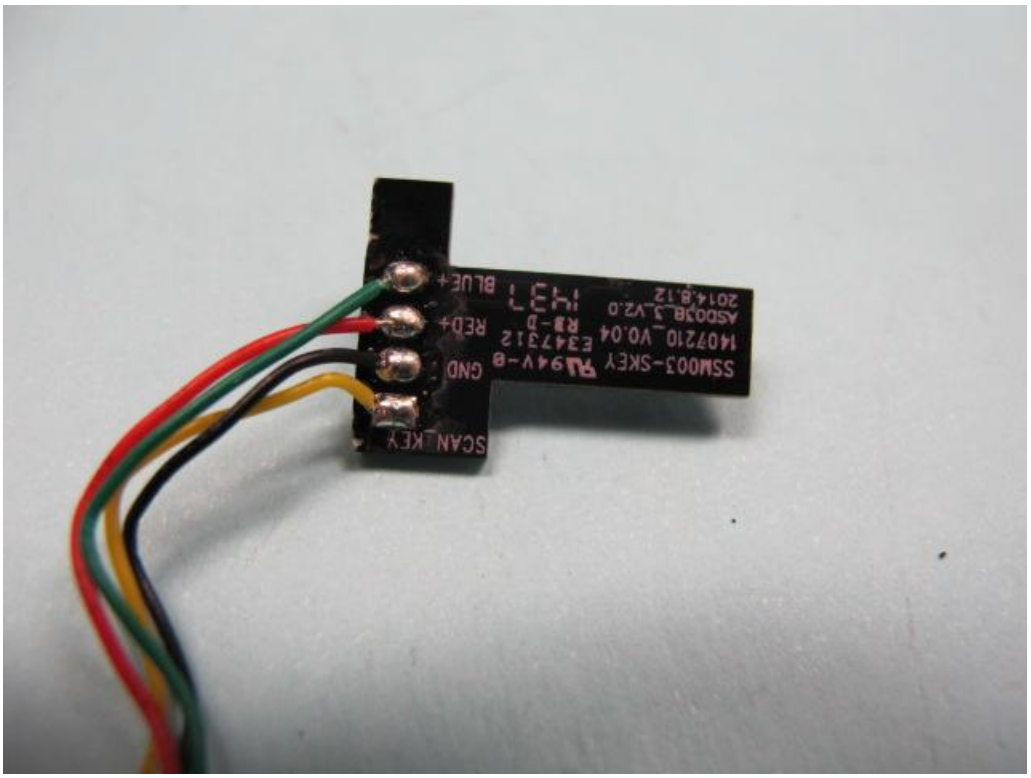


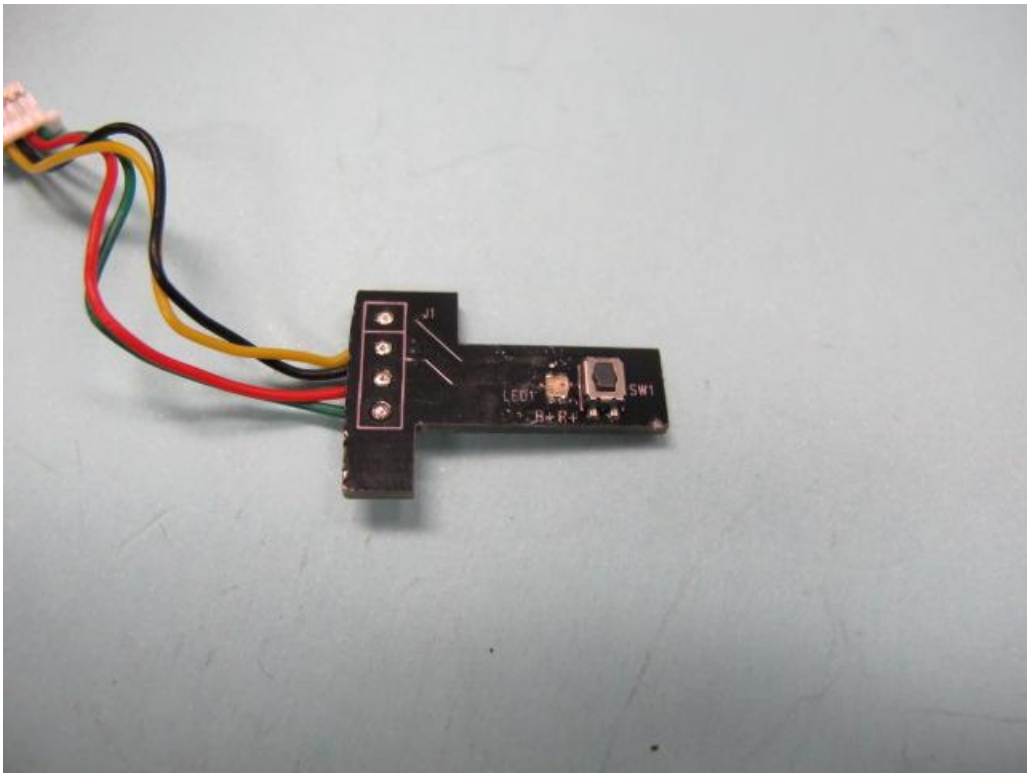



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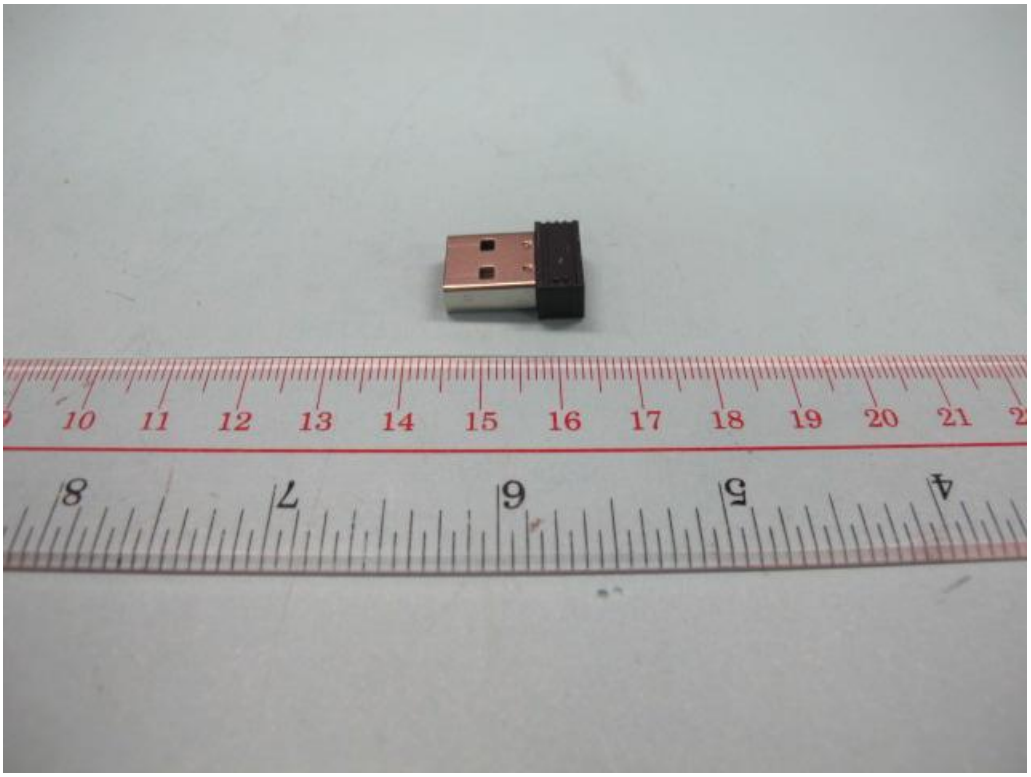


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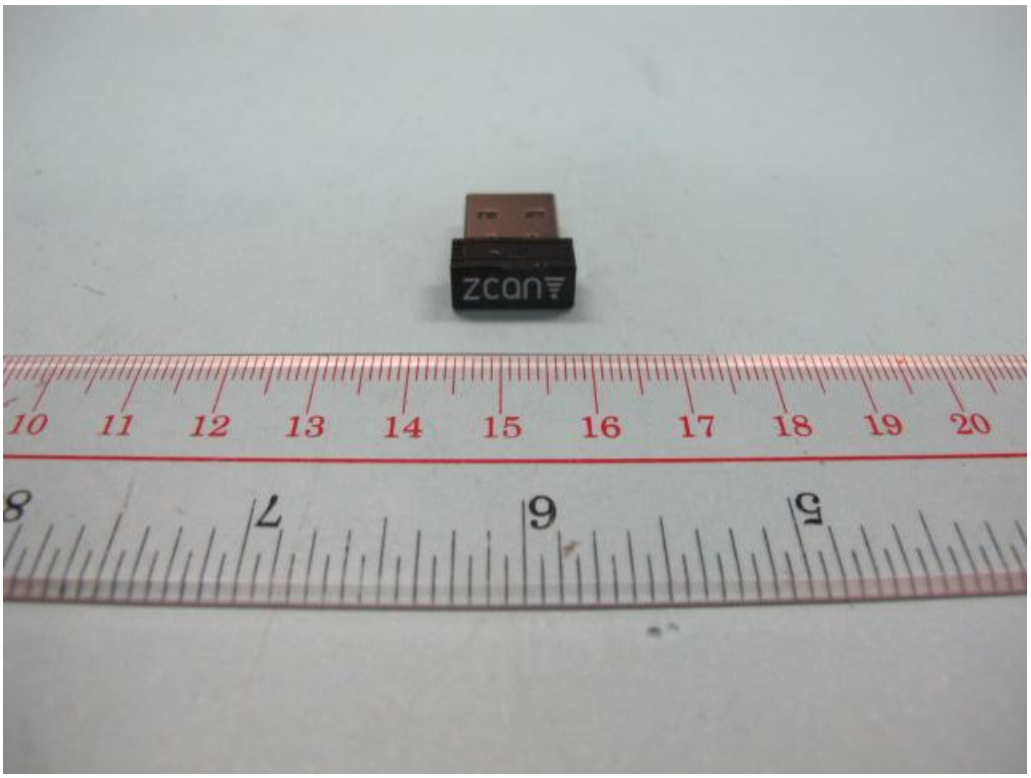
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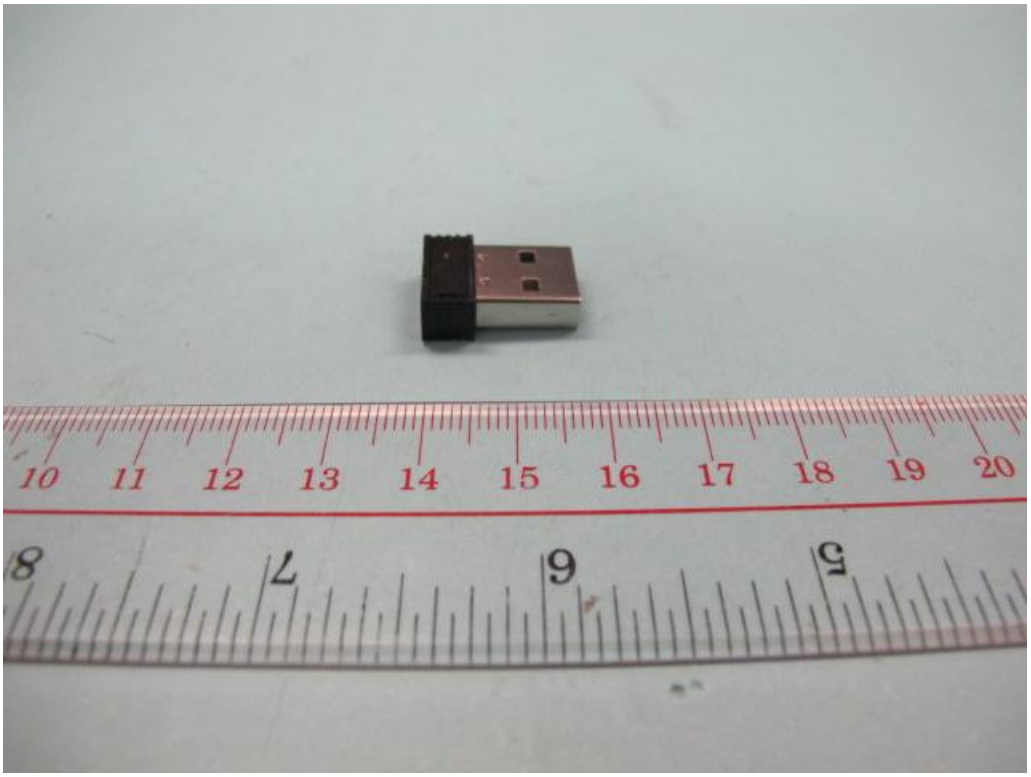
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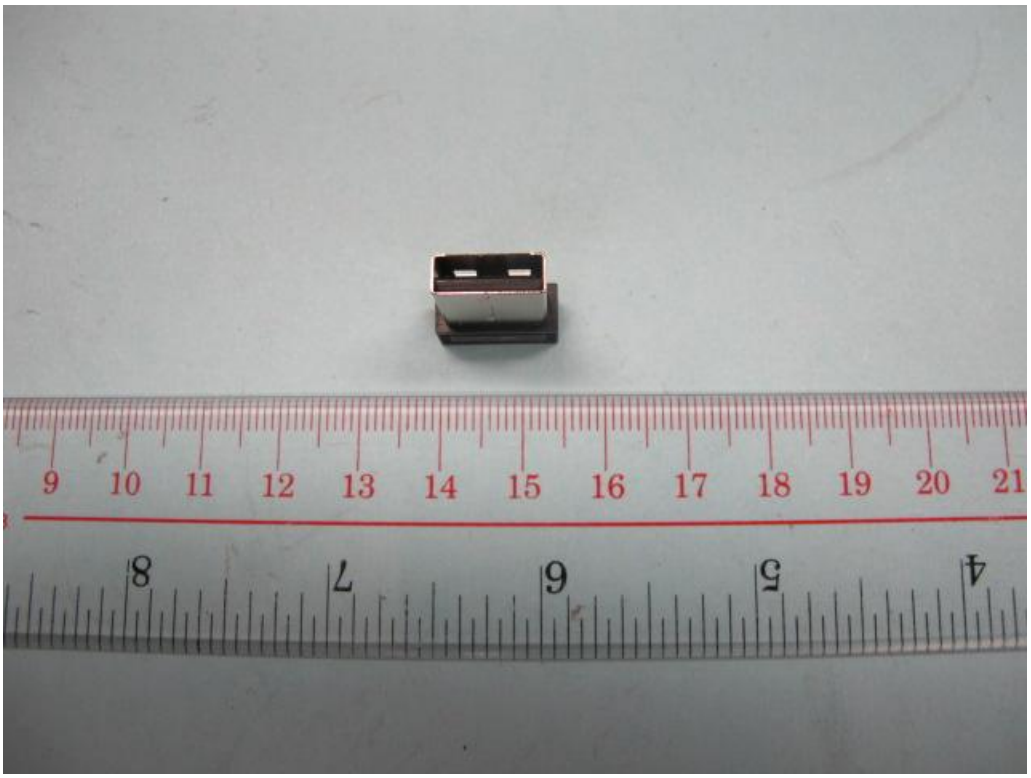
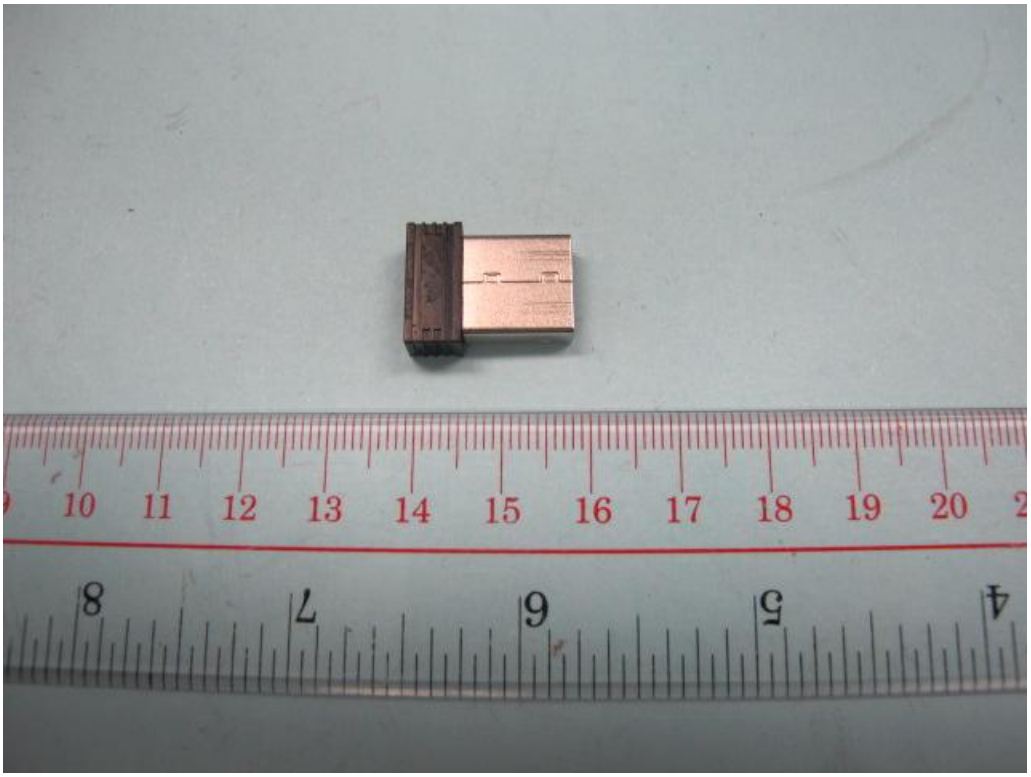
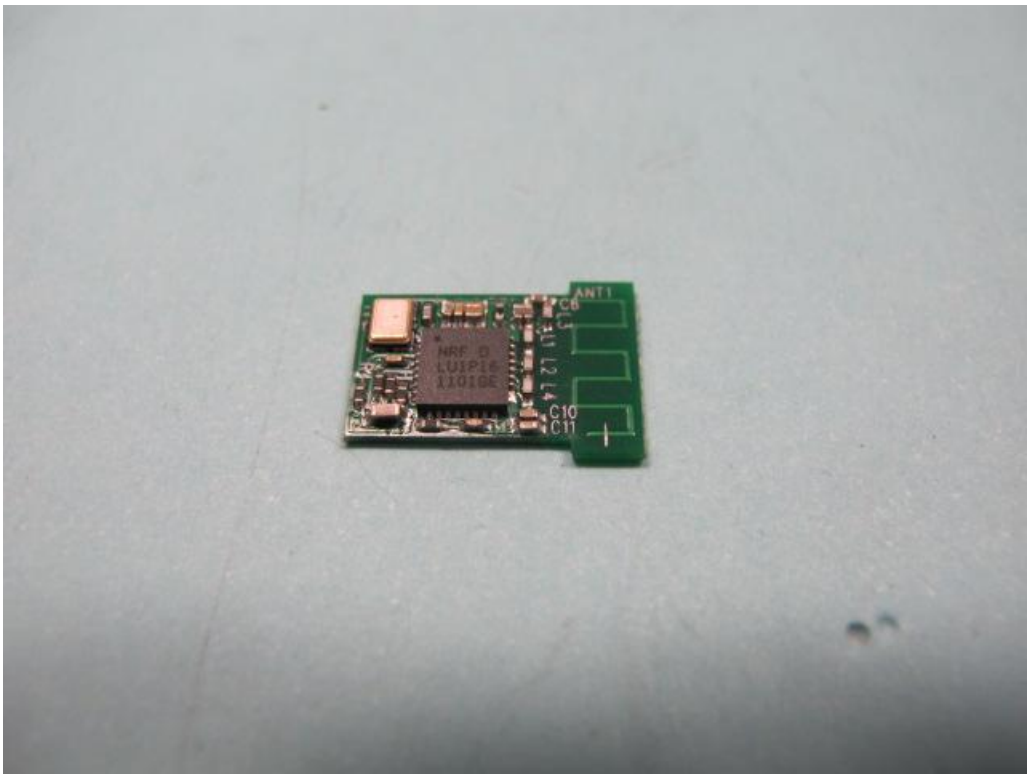




TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
Building 12&13, Zhiheng Wisdomland Business Park, Nantou Checkpoint Road 2, Nanshan District, 518052 Shenzhen, CHINA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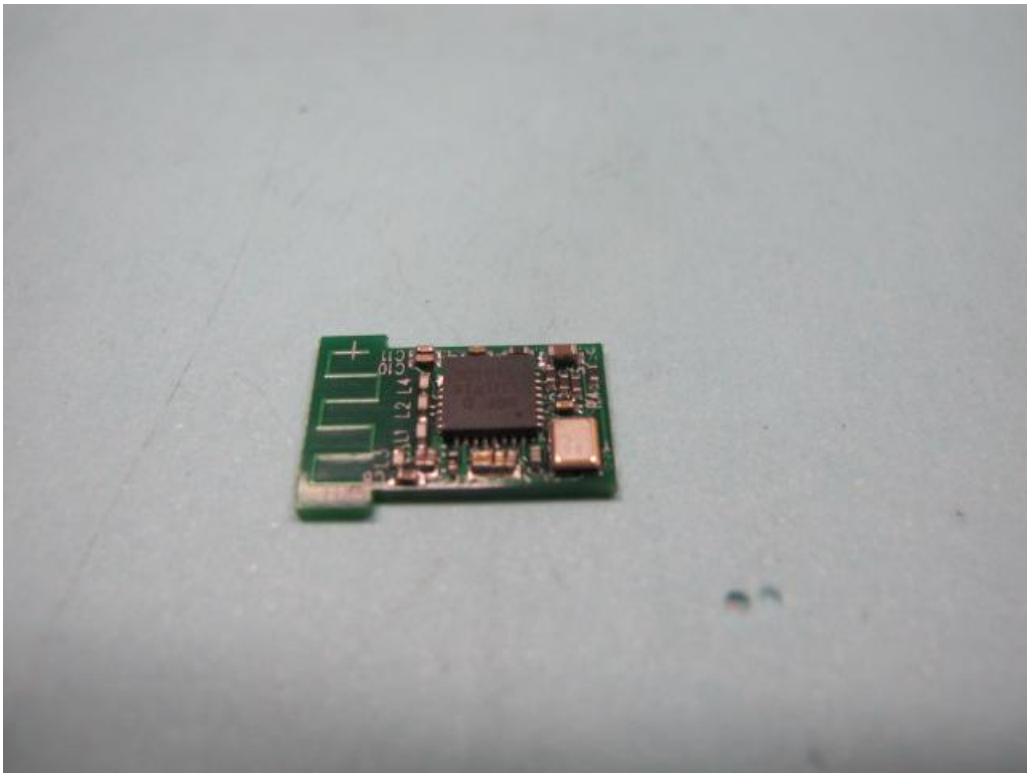

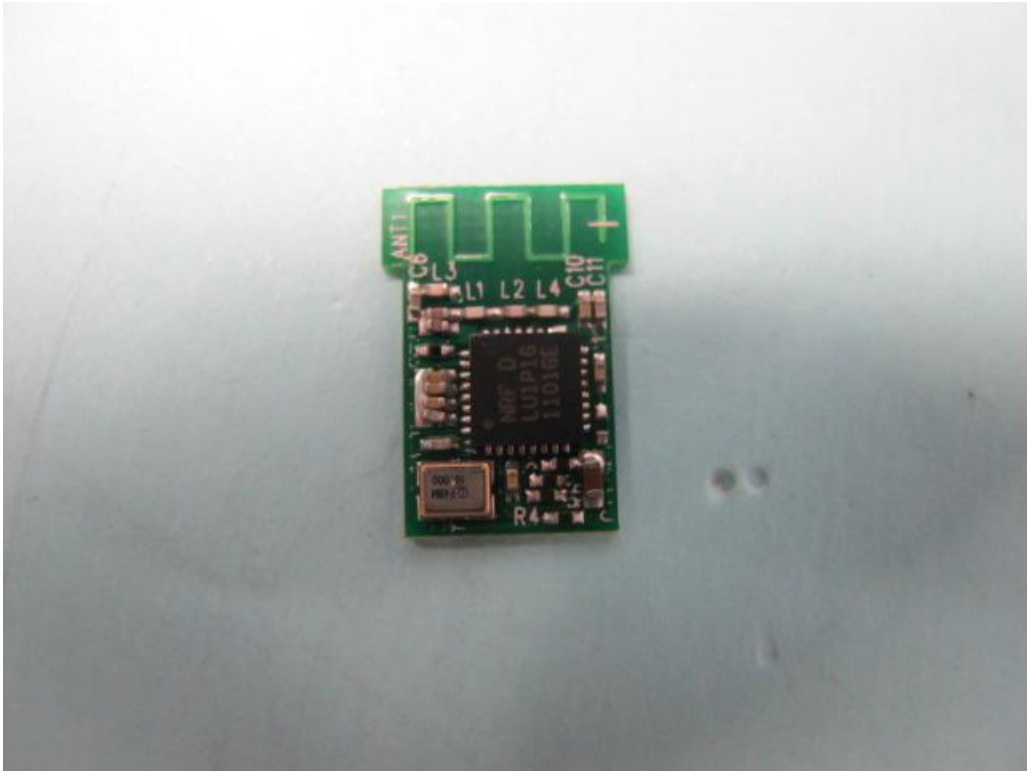
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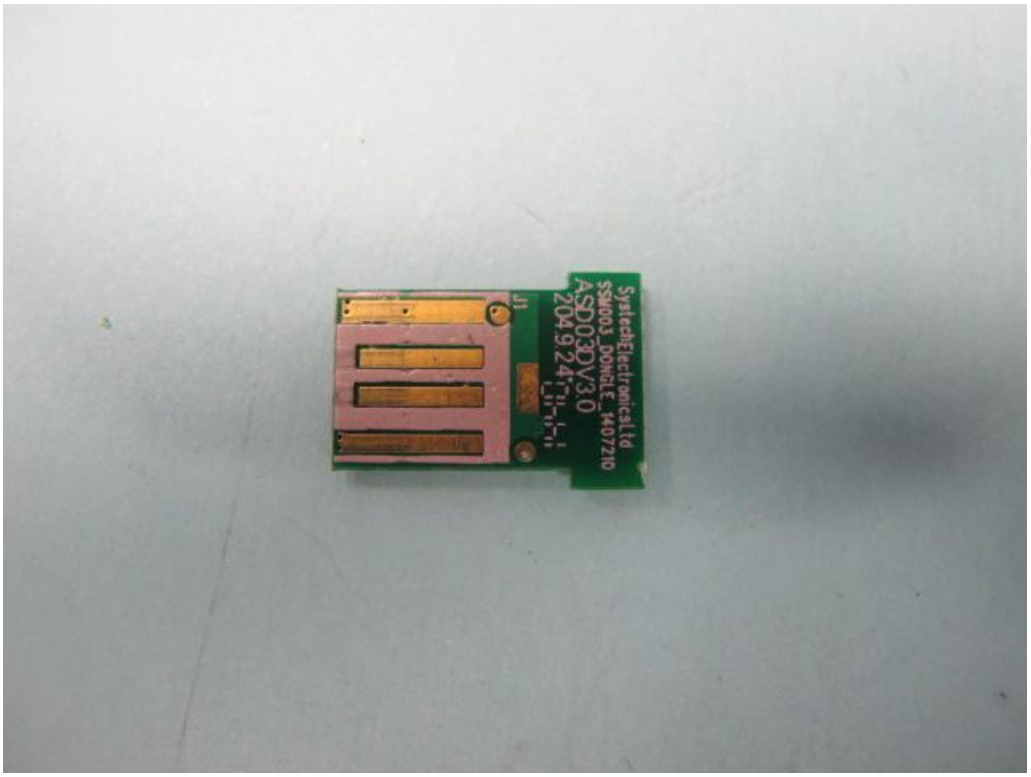
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