Near Field Communication Total Solution
Key contactless mobile payment solutions are used by different ways such as independent NFC chip, SIM card, smart SD card.
<table>
<thead>
<tr>
<th>Technology</th>
<th>NFC</th>
<th>Sim-Pass dual interface cards</th>
<th>RF-SIM</th>
<th>MicroSD card</th>
<th>RF-SIM</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>SWP</td>
<td>Card + antenna solution</td>
<td>Full card solution</td>
<td>MicroSD card solution</td>
<td>Full card Solution</td>
</tr>
<tr>
<td><strong>Working Frequency</strong></td>
<td>13.56Mhz</td>
<td>13.56Mhz</td>
<td>13.56Mhz</td>
<td>13.56Mhz</td>
<td>2.4Ghz</td>
</tr>
<tr>
<td>Function module integrated way</td>
<td>NFC Phone Solution</td>
<td>Application and security data in the card; RF module and the antenna in the Device</td>
<td>All in device</td>
<td>Application and security data in the card; RF module and the antenna in the device</td>
<td>All in SIM card</td>
</tr>
<tr>
<td>Transactions distance</td>
<td>0-10cm</td>
<td>0-10cm</td>
<td>0-10cm</td>
<td>0-5m</td>
<td>0-5m</td>
</tr>
<tr>
<td>Mobile Device</td>
<td>Need change</td>
<td>do not need</td>
<td>Need change</td>
<td>do not need</td>
<td>do not need</td>
</tr>
<tr>
<td>POS machine updated</td>
<td>Simple, low cost</td>
<td>Simple</td>
<td>Simple</td>
<td>Simple</td>
<td>Difficult, high cost</td>
</tr>
<tr>
<td>Sunlord product line up</td>
<td>A variety of magnetic sheet; NFC flexible antenna</td>
<td>A variety of magnetic sheets; flexible antenna</td>
<td>Laminated ferrite antenna; Module</td>
<td>laminated ferrite antenna; NFC module</td>
<td>A variety of magnetic sheet : NFC flexible antenna; laminated ferrite antenna</td>
</tr>
<tr>
<td>picture</td>
<td><img src="image1.png" alt="Image" /></td>
<td><img src="image2.png" alt="Image" /></td>
<td><img src="image3.png" alt="Image" /></td>
<td><img src="image4.png" alt="Image" /></td>
<td><img src="image5.png" alt="Image" /></td>
</tr>
</tbody>
</table>

**Main Technical Route-Summary**
**NFC Introduction**

- **NFC (Near Field Communication)**: The short-range wireless communications technology, which is developed by Phillip and Sony.
- Contactless reader, contactless card, and peer-to-peer functionality are integrated into a single NFC chip, creating a myriad of new opportunities for the consumer’s lifestyle. It is an open platform, fast wireless network setting, also service Bluetooth and 802.11 device.
- The NFC is compatible with Sony FeliCaTM card and many contactless smart card, the architecture is based on ISO14443A, Philips MIFARE technology.
Operation Mode

NFC follow the contactless smart card standard such as ISO / IEC 18092, with NFCIP-1, and ISO / IEC 14443.

1. **Read / Writer**
   NFC device can read and write any kind of tag and label, Read NFC data.

2. **Peer-to-Peer**
   Both NFC devices can exchange the message and data in accordance with ISO / IEC 18092.

3. **Card Emulation**
   NFC device can also be used as a label or contactless card.
NFC Main Technical Parameters

- Based on RFID technology at **13.56 MHz**.
- Operating distance typically up to **10 cm**.
- **Compatible** with today’s contactless RFID technologies.
- Data exchange rate today up to **424 kbit/s**.
- NFC is **complementary** to Bluetooth® and Wi-Fi technologies.
- ISO14443 (contactless Smartcards), ISO18092 (NFCIP-1)
- Current System:  
  - **MasterCard**: Paypass  
  - **Visa**: Visa & Wave
Main Technical Route - NFC

NFC, Bluetooth, RFID

**NFC**
- Payments, POI
- 13.56 MHz RFID
- Max 10cm
- Near field inductive coupling

**Bluetooth**
- Cable replacement
- 2.4 GHz ISM Band
- Max 10m
- Far field radio transmission

**RFID**
- Remote identification
- All ISM bands
  - 13.56 MHz / 2.4 GHz
- Few meters
**NFC Applications**

**Four basic types:**

- Payment and ticketing
- Electronic ticket
- Smart media
- Data exchange

---

The possibilities for using Near Field Communication are nearly limitless. The potent attraction of touch-less transactions will help weave NFC technology into the fabric of our daily lives.
NFC Applications

NFC device on the market

- Samsung Galaxy SIII, Galaxy SII HD LTE, Galaxy Note II
- Google Galaxy Nexus, Galaxy Nexus 7, Nexus 10
- Nokia Lumina 820, lumina920
- Sony LT26i, LT22i, MT27i; Sony Xperia Tablet Z
- Huawei U8650, Turkce ll T20
- LG Optimums LTE, LG Prada 3.0
- ZTE TurkcellT11; Nubia Z5
- HTC One X; HTC J Butterfly
- BlackBerry 10; Motorola Razri
- ..........
Sunlord Product Lineup

Sunlord NFC Solutions

- Ferrite magnetic sheet
- NFC flexible antenna
- Multilayer ferrite antenna (under development)
- NFC module antenna (under development)

Applications

- Various electronic devices
- NFC modules
- Chipsets
Sunlord Product Lineup

- **Ferrite magnetic sheet**
  - 2012: \( u'=130, u''<5 \), \( T:100\mu m \)
  - 2013: \( u'=150, u''<5 \), \( T:100\mu m \)
  - 2014: \( u'=160, u''<3 \), \( T:60\mu m \)
  - 2015: \( u'=180-210, u''<2 \), \( T:50\mu m \)

- **NFC flexible antenna**
  - 2012: \( T:0.18\text{mm min} \)
  - 2013: \( T:0.16\text{mm min} \)
  - 2014: \( T:0.15\text{mm min} \)
  - 2015: \( T:0.10\text{mm min} \)

- **Multilayer ferrite antenna (Under development)**
  - 2012: \( T:0.45\text{mm min} \)

- **NFC Module (Under development)**
  - 2012: \( T:0.23\text{mm min} \)

- **NFC Module**

**Legend**
- Developed
- Development
- Plan
# Product Introduction - Ferrite Magnetic Sheet

## Ferrite Magnetic Sheet:

<table>
<thead>
<tr>
<th>Product Features</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Part Number</strong></td>
<td><strong>FS Series</strong></td>
</tr>
<tr>
<td></td>
<td><strong>FS60W60T14P125A02BN</strong></td>
</tr>
<tr>
<td><strong>Standard thickness (mm)</strong></td>
<td><strong>0.08/0.1/0.14 (Customized)</strong></td>
</tr>
<tr>
<td><strong>standard size (mm)</strong></td>
<td><strong>60×60/70*56 max. (Customized)</strong></td>
</tr>
<tr>
<td><strong>working temperature (℃)</strong></td>
<td><strong>-40 ~ 85</strong></td>
</tr>
<tr>
<td><strong>Permeability @13.56MHz</strong></td>
<td><strong>u’=150 +/-20%</strong></td>
</tr>
<tr>
<td></td>
<td><strong>u” =3~5 max.</strong></td>
</tr>
</tbody>
</table>

---

## Ferrite Magnetic Sheet Specifications:

- **Application:** N-NFC ; S-shielding
- **Package:** B- Box, R-roll
- **Internal Code:** A02
- **Relative magnetic permeability:** u’=125
- **The total thickness:** 0.14mm
- **Product Size:** 60×60 mm
- **Product Name:** Ferrite magnetic Sheet
Product Introduction - Ferrite Magnetic Sheet

Antenna Magnetic Field Distribution Diagram

- No magnetic sheet
- With magnetic sheet

Magnetic field
Antenna

Eddy current field

Battery

Ferrite Sheet
Antenna Magnetic Field Intensity Distribution of Different Height

No magnetic sheet

With magnetic sheet

z=10mm
- 0.68 A/m
- 5.69 A/m

z=20mm
- 0.1 A/m
- 2.3 A/m

H: A/m
# Product introduction - Ferrite Magnetic Sheet

## Recommend NFC P.N

<table>
<thead>
<tr>
<th>Part Number</th>
<th><a href="mailto:Permeability@13.56MHz">Permeability@13.56MHz</a></th>
<th>Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Real</td>
<td>Imaginary</td>
</tr>
<tr>
<td></td>
<td>μ'</td>
<td>μ''</td>
</tr>
<tr>
<td></td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>FS60W60T10P02BN</td>
<td>140 ± 10%</td>
<td>5 Max.</td>
</tr>
<tr>
<td>FS70W56T10P02BN</td>
<td>140 ± 10%</td>
<td>5 Max.</td>
</tr>
<tr>
<td>FS60W50T14P02BN</td>
<td>125 ± 10%</td>
<td>5 Max.</td>
</tr>
<tr>
<td>FS60W50T14P03BN</td>
<td>125 ± 10%</td>
<td>5 Max.</td>
</tr>
<tr>
<td>FS60W60T14P02BN</td>
<td>125 ± 10%</td>
<td>5 Max.</td>
</tr>
<tr>
<td>FS60W60T14P03BN</td>
<td>125 ± 10%</td>
<td>5 Max.</td>
</tr>
<tr>
<td>FS70W56T14P02BN</td>
<td>125 ± 10%</td>
<td>5 Max.</td>
</tr>
</tbody>
</table>
Product Introduction - Ferrite Magnetic Sheet

- Ferrite Magnetic Sheet (After Cutting)

- Provide different size
- Provide different thickness
- Provide die cutting services
Multilayer Ferrite Antenna Specifications:

- **Package:** T-Taping
- **Antenna Material:** F-ferrite
- **Feature code number:** B01
- **Operating frequency:** 13.56Mhz
- **Product Size:** 10 × 8 mm
- **Product Name:** Low temperature co-fired ferrite antenna

**SLFA 108 13R56M B01 F T**

<table>
<thead>
<tr>
<th>Product Features</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part No.</td>
<td>SLFA Series</td>
</tr>
<tr>
<td></td>
<td>SLFA10813R56MB01FT</td>
</tr>
<tr>
<td>Standard thickness (mm)</td>
<td>0.1/0.2/0.25</td>
</tr>
<tr>
<td>Stand Size (mm)</td>
<td>10X8/11X8</td>
</tr>
<tr>
<td>Operating Temperature (℃)</td>
<td>-40 ~ 85</td>
</tr>
<tr>
<td>Operating frequency (MHz)</td>
<td>13.56</td>
</tr>
</tbody>
</table>
Product Introduction – Chip Antenna (Under Development)

Multilayer Ferrite Antenna
NFC Flexible Antenna:

<table>
<thead>
<tr>
<th>Product Features</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part Number</td>
<td>FA Series&lt;br&gt;FA-6040-13R56M-A01-F-B</td>
</tr>
<tr>
<td>Thickness of ferrite (mm)</td>
<td>0.06/0.08/0.1</td>
</tr>
<tr>
<td>Double-sided adhesive (mm)</td>
<td>0.01/0.02/0.03</td>
</tr>
<tr>
<td>Single / Double FPC thickness (mm)</td>
<td>0.07/0.08</td>
</tr>
<tr>
<td>Single-sided adhesive (mm)</td>
<td>0.01/0.02/0.03</td>
</tr>
<tr>
<td>Total thickness (mm)</td>
<td>0.18 min.</td>
</tr>
</tbody>
</table>

NFC Flexible Antenna Specifications:

- **FA - 6040 - 13R56M - A01 - F - B**
- Package: Box
- Antenna Material: F-FPC flexible circuit board
- Feature code number: A01
- Operating Frequency: 13.56Mhz
- Product Dimensions: 60 × 40 mm
- Product Name: flexible antenna

FPC flexible circuit board
Double-sided adhesive
Ferrite
double-sided or single-sided adhesive
Product Introduction - NFC Flexible Antenna

- **Without Ferrite Sheet**
  - Color C/L
  - FPCB
  - Double sided Tape

- **With Ferrite Sheet**
  - Color C/L
  - Ferrite Sheet
  - FPCB
  - Double sided Tape

*Common Thickness:*
- **Without Ferrite Sheet:** 0.1mm-0.15mm
- **With Ferrite Sheet:** 0.2mm-0.3mm
Product Introduction-NFC Flexible Antenna

Design Process of FPC Antenna

- **Space Evaluation**
  - PCB area: more than 1500mm$^2$
  - Generally, thickness >0.2mm

- **Track Calculation**
  - Math CAD
  - Track Thickness: more than 0.035mm
  - Higher Q value

- **Proofing**
  - FPC: different track width, track space, turns etc.

- **Matching Design**
  - Understanding different platform characteristics
  - Ensure FPC have appropriate impedance and frequency characteristics.
Product Introduction-NFC Flexible Antenna

- NFC Flexible Antenna:
NFC Flexible Antenna Mounting Position:

- NFC antenna on the back cover
- NFC antenna on the battery
**Ultra Thin Antenna Solution**

**PDS Technology**
- Min. print thickness: 0.03mm
- Min. total NFC antenna thickness: 0.1mm
- Ultra Thin, no limit on area, shape and material of back cover

**Ultra Thin FPC**
- Min. FPC thickness: 0.05mm
- Min. antenna thickness: 0.13mm with Ferrite Sheet
- Applications: Nubia Z5, Nubia Z5mini

Cooperation With ShangHai DEMAN
DEMAN NFC Antenna Solution

Metal Back Cover Solution

Cooperation With ShangHai DEMAN

DIA Antenna

- Small size, customized, 35*18*0.4mm
- Set closed to camera module or edge side
- Compatible with CMCC standard
- 270° reception, improve user experience

270° reception
DEMAN NFC Antenna Solution

- NFC Module

- NFC Module for Union pay Box
- Support I2C, UART, SPI I/F

Cooperation With ShangHai DEMAN

STB
Household Appliances
Tele-medicine
Technologies Advantages

Core Competence

Material technology
Manufacturing technology
Measure technology
R&D design
Technologies Advantages

Material Technology

- Strong materials development capabilities and enough production capacity
- Ferrite materials formula is developed by Sunlord
Technologies Advantages

Flexible Antenna Matching Technology

IC terminal

Conventional antenna

IC terminal

Differential antenna
Technologies Advantages

- **Measurement Techniques**
  - Material Measurement
  - Antenna Matching Measurement
  - Certification Measurement

**EMVCo**

- freq = 13.60 MHz
- \( \text{dB(S(1,1))} = -35.82 \)

**ISO**

- freq = 13.60 MHz
- \( S(1,1) = 0.016 / 81.989 \)
- Impedance = \( Z_0 \times (1.004 + j0.032) \)

**NFC Forum**

- Diameter D1 = 10 mm
- D2, D3 = 20 mm
- Height = 5 mm
- Test Points:
  - 5 mm @ 5 mm
Technologies Advantages

- Measurement Techniques

EMVCo

- PICC, PCD
  - Level 1
    - Analog
  - Digital
  - Level 2
    - Function
    - Measure

Operating Volume

Landing Plane
Technologies Advantages

- Measurement Techniques

ISO

- PICC, PCD
  - Level 1
    - Analog
  - Level 2
    - Digital
    - Function Measure

Load modulation results

Energy in (mV)

Field strength (A/m)

Limit
Low side band
Up side band
Technologies Advantages

- Measurement Techniques

NFC Forum

- Poller, Listener
- Analog
- Digital
- A.B.F

Diameter $D_1 = 10\text{mm}$
$D_2, D_3 = 20\text{mm}$
Height = 5mm

Test Points
5p @ 0mm
9p @ 5mm
Technologies Advantages

Measurement Techniques

NFC Forum

- **Poller**

- **Listener**
Technologies Advantages

- **FIME Test**
  For EMVCO

- **AT4 Measurement Solution**
  For ISO & NFC Forum
Samples Delivery of NFC Antenna

Program Information
- IC datasheet
- Schematic diagram and figure number
- 3D drawing
- Requirement

Simulation & Evaluation
- Simulation Software
- Evaluation Board

Antenna Design
- Layout
- Ferrite sheet selection
- Matching design
- Measure and test.

Sample

1~2 days
1~2 days
2~3 days
5~7 days
NPI Process of NFC Antenna

Customer requirements analysis

Program communication

Antenna adjustment

Sample

Project evaluation

Trial run

MP

1~2 weeks

2~3 Days

1~2 weeks

1~2 weeks

2 weeks
Production Capacity

Ferrite Magnetic Sheet
Capacity/ month: 8kk (60*60mm) for 2014, 10~12kk (60*60mm) for 2015

NFC FPC Antenna
Capacity/ month: 8kk for 2014, 10~12kk for 2015
Thank You!