Tiny 4K Camera

Sold 3.9M Sets in 2013

66%
SD Card Types

- **Form Factors**
  - Standard Size SD Card
  - microSD Card

- **Functions**
  - SD Memory Card
  - SDIO Card
  - SD Combo Card (SD Memory + SDIO Functions)
    - iSDIO Wireless LAN SD Card
    - iSDIO TransferJet SD Card
  - smart microSD (microSD with Secure Element or with or without NFC interface)

- **Memory Capacities**
  - SDSC: Standard Capacity (≤ 2GB)
  - SDHC: High Capacity (2GB < - ≤ 32GB)
  - SDXC: eXtended Capacity (32GB < - ≤ 2TB)

- **Bus Interfaces**
  - Non UHS (Non Ultra High Speed) Card
  - UHS-I Card
    - UHS50: SDR50 is mandatory (50MB/sec Max.)
    - UHS104: SDR50 and SDR104 is mandatory (104MB/sec Max.)
  - UHS-II Card
    - UHS156: FD156 is mandatory (Full Duplex 156MB/sec Max.)
    - HD312 is optional (Half Duplex 312MB/sec Max.)
Comparison of Interface Speed

Bus mode
- Default Speed
  - DS
- High Speed
  - HS
- UHS50
  - UHS-I SDR50/DDR50
- UHS104
  - UHS-I SDR104 (Optional)
- UHS156 (Gen.1)
  - UHS-II FD156
- UHS312 (Gen.2 TBD)

Comparison of Interface Speed:
- Gen1: Generation 1 Card Type
- Gen2: Generation 2
- FD: Full Duplex
- HD: Half Duplex

Throughput (MB/s):
- Default Speed: 0 MB/s
- High Speed: 12 MB/s, 25 MB/s, 39 MB/s, 50 MB/s, 78 MB/s, 104 MB/s
- UHS-I SDR50/DDR50: 156 MB/s
- UHS-I SDR104 (Optional): 312 MB/s
- UHS-II FD156: 624 MB/s
- UHS-II HD312 (Optional): 978 MB/s
- UHS-II (Gen2) HD624 (Optional): 1392 MB/s

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**SD Speed Class & Video Speed Class**

<table>
<thead>
<tr>
<th>SD Bus Mode</th>
<th>Ver. 4.0 Card</th>
<th>Ver. 5.0 Card</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Default Speed Mode</strong></td>
<td>SDSC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Class 2, 4, 6 (C2, C4, C6)</td>
<td></td>
</tr>
<tr>
<td><strong>High Speed Mode</strong></td>
<td>SDHC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Class 10 (C10)</td>
<td></td>
</tr>
<tr>
<td><strong>UHS-I and UHS-II Mode</strong></td>
<td>SDHC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>UHS Speed Class 1 (U1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>UHS Speed Class 3 (U3)</td>
<td></td>
</tr>
<tr>
<td><strong>UHS-II Mode</strong></td>
<td>SDHC</td>
<td></td>
</tr>
</tbody>
</table>

**SD Association**

**Phison Electronics Corp.**
There are 4 types of Pads Appearance:

- **Basic Pin Assignment**
- **Antenna Pads**
- **NFC Interface**
- **NFC + UHS-II Interface**
High Resolution

⇒ High Transfer Rate

⇒ High Capacity

SD (480p)

HD (1080p)

4K (2160p)
Faster Wireless Tinier Future

UHS-II / U3 NFC with Security microSD
**UHS-I**

R 95 / W 90; Available NOW

**UHS-II**

R 280 / W 200; MP soon

**High Capacity**

256GB Cards

**SD Card**
CL10 with TLC

R 80 / W 20; Available NOW

SD Card
TransferJet Technology

Wireless Technology Comparison

- Device-to-Device file transfer
- Content download KIOSK
- Photo print KIOSK
- Internet connection in public area
- Office network
- Home network
- Mobile payment
- Tollgate payment
- Music streaming
- Hands-free headset

TransferJet Format Roadmap

- Instantly getting content at tollgate while NFC payment
- 4K video file transfer
- HD video file transfer
- High-performance industrial applications
- Photo, music and video file transfer

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# smart microSD Variation

<table>
<thead>
<tr>
<th></th>
<th>NFC microSD</th>
<th>SWP smart microSD</th>
<th>HCE smart microSD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NFC Phone Support</strong></td>
<td>Most of microSD host devices can be used</td>
<td>Only very few NFC phones support SWP smart microSD</td>
<td>Android 4.4 NFC phones with microSD slot</td>
</tr>
<tr>
<td><strong>NFC Antenna Performance</strong></td>
<td>Limited by antenna size and RF shielding of host devices</td>
<td>Depends on NFC phone equipped antenna</td>
<td>Depends on NFC phone equipped antenna</td>
</tr>
<tr>
<td><strong>SDA Standard</strong></td>
<td>The contactless interface is not defined by SDA</td>
<td>SDA has defined the additional SWP pins on microSD</td>
<td>Using generic microSD bus for NFC transaction No additional protocol standardization is required</td>
</tr>
<tr>
<td><strong>Components</strong></td>
<td>Many additional components. The NAND Flash size is limited</td>
<td>Need additional components to switch SWP VDD</td>
<td>Nearly the same as generic microSD</td>
</tr>
<tr>
<td><strong>Smartcard Chip Types</strong></td>
<td>Dual interfaces smartcard chip connecting to NFC controller</td>
<td>SWP interface smartcard chip</td>
<td>General smartcard chip supporting ISO7816 and GP</td>
</tr>
<tr>
<td><strong>Unit Cost</strong></td>
<td>High</td>
<td>Middle</td>
<td>Low</td>
</tr>
</tbody>
</table>

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*Phison Electronics Corp.*

*PHISON: Know What You Need*
Host CPU

Mobile Payment Apps

API

HCE*

Controller

SE

NAND Flash

NFC Module

NFC Reader

HCE

smartSD

* Host based Card Emulation
NFC + smartSD
**smartSD-based or not?**

- **Minimal HCE (software only)**
  - App with limited financial risk for service provider and end user
  - Typical of private use of NFC card emulation

- **smartSD Secure Element**
  - smartSD security token for HCE

- **Driven by business needs such as:**
  - User identification
  - Remote Authentication
  - Non-repudiation
  - Confidentiality

- **+ technical aspects such as:**
  - Local secure computing to reduce transaction time while secured
  - High Level Security Transaction

smartSD could be issued personalized as current contactless card. HCE security token cardlet could be generic enough to apply to some services.
Storage... beyond Cards?
SD Card, smartSD

**Embedded**
- Portable Device
  - eMMC

**Other Storage**
- Cloud Server
  - SSD
SSD

MP: 2014 Q4

MLC: R 540 / W 540
TLC: R 540 / W 320

The Best SSD Controller Ever

SATA-III, PCIe (Gen.2, Gen.3)
We promise to Deliver...

**Turnkey**
We offer hassle-free “one-stop shopping” to assist our customers launching their products on time.

**OEM/ODM**
Working with OEM/ODM means unique product requirements and extensive customization. With the experience and manpower, we are ready!

**System Integration**
We are the “Somebody” who takes care of everything from NAND to retail.

**IC Design**
Designing our own IC means providing flexibility to our customers.
From Retail to Enterprise

eMMC  SD  SSD

From SLC, MLC to TLC
PHISON
Fulfills All Your Imagination