

## 2GB Micro SD Card will be eliminated by the market

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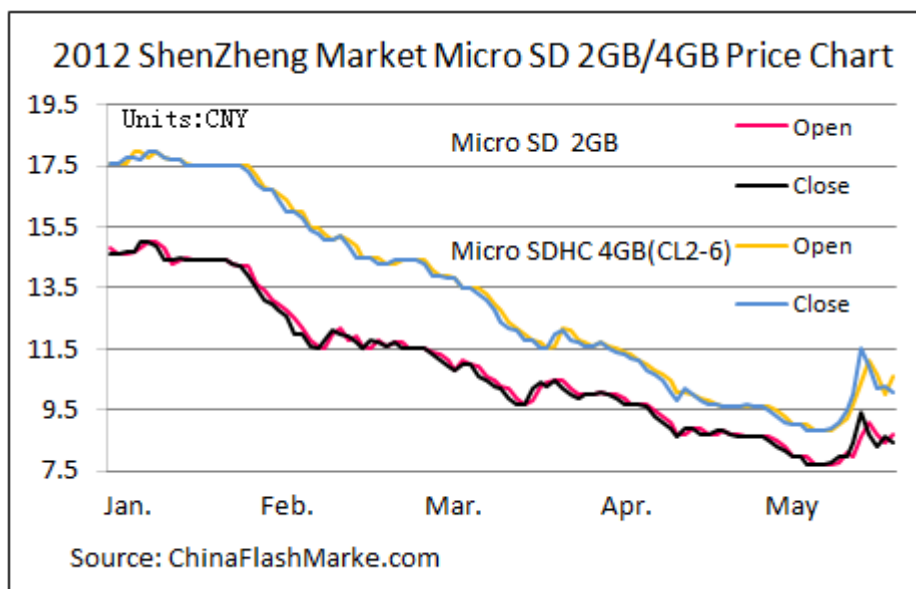
29/6/2012

The price in mobile flash market is the most active in the NAND flash market and the price volatility is huge. It changes over three times in one day. 2GB Micro SD card used to be the main stream capacity in the market and also it's the main stream capacity of standard mobile equipment. With the improving of NAND flash technology, end-use customers and smart phone needs higher capacity of memory cards and bundling memory cards. Therefore, 2GB Micro SD card will be pushed out by higher capacity.

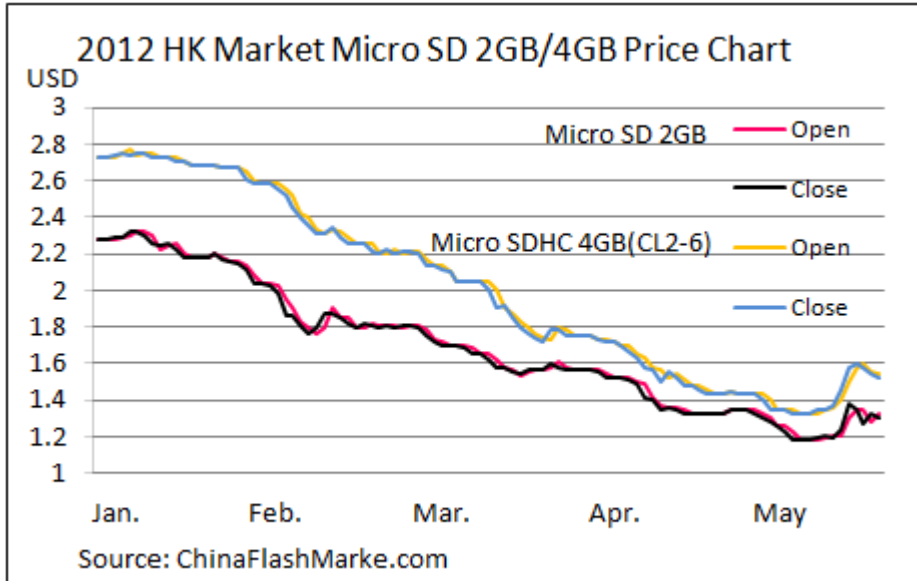
Nowadays, the market demand of 2GB Micro SD is clearly declined and this situation reflected into the price, suppliers lower the price in order to get more buyers. Unfortunately, even the price goes down continually, the market demand of 2GB Micro SD is still a slump and volume has become shrinking.

According to the statistics of ChinaFlashMarket.com, the 2GB Micro SD one fall to lowest price of ¥7.7 in Shenzhen market, and \$1.18 in HongKong market; 4GB Micro SD has dropped to ¥8.8 in Shenzhen market, and \$1.32 in HongKong market. It can be seen from the price, the capacity of 4GB doubled the 2GB, but there is only ¥1 different in price. For the ultimate consumers, the price of 4GB flash seems more acceptable so they tend to buy 4GB or higher capacity products. The main stream capacity of Micro SD market is quietly changing.

**2012 Price Chart of Micro SD 2GB/4GB in ShenZhen Market**



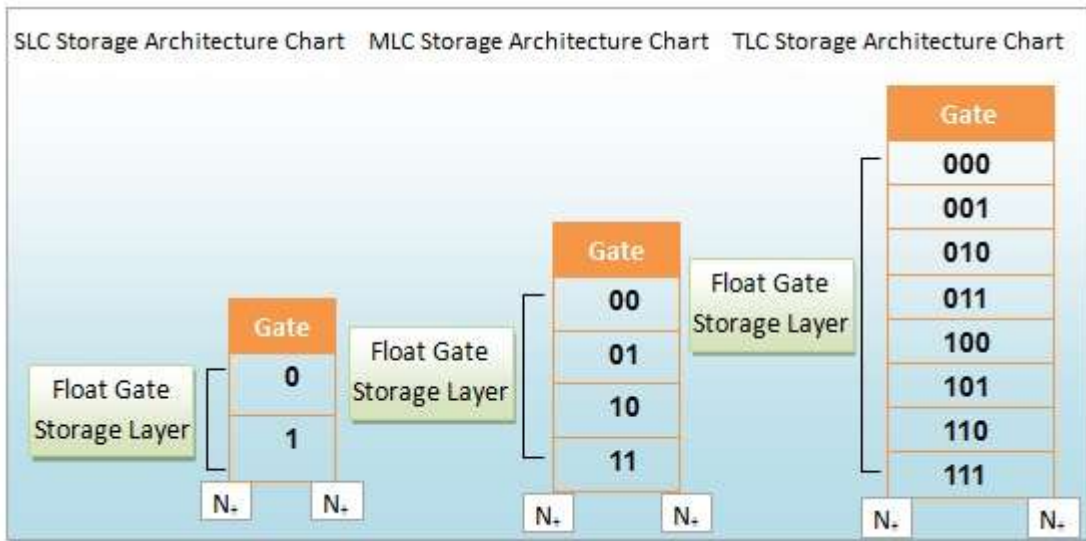
2012 Price Chart of Micro SD 2GB/4GB in HK Market



Technology continues to improve

In the SLC age, the NAND Flash technology was able to store 1 bit data in one storage cell, and 2 bit of data in one storage cell after step into the MLC age, so the MLC chip storage capacity is twice as much as the SLC chip capacity, and then it is the age of TLC, 3 bits of data can be contained in 1 storage cell. Following the progress of technology, the capacity is increasing and at the same time, the cost of production is also declining.

SLC/MLC/TLC Architecture differences



In 2012, Samsung mass produce 21nm 64Gb TLC, Micro mass product 20nm 128Gb MLC, Toshiba/Sandisk is 19nm 128Gb TLC, SK Hynix uses 20nm 64Gb MLC to battle with his competitors. With the improving of nanometer technology, huge amount of low-cost NAND Flash comes out.

### Manufacturers Flash Road MAP

Manufacturers	2008	2009	2010	2011	2012	2013
<b>Samsung</b>	42nm	35nm	32nm	27nm	21nm	16nm
<b>Toshiba/Sandisk</b>	43nm		32nm	24nm	19nm	1Xnm
<b>Micron</b>	34nm		25nm		20nm	18nm
<b>SK Hynix</b>	46nm		35nm	26nm	20nm	15nm

Let's take Samsung technology as example, the previous 27nm technology can cut out more than 900 pieces 16Gb DIE in a 12-inch wafer, and can cut out more than 1400 pieces based on 21nm TLC. As process technology continues to improve, each unit of production has been improved more than 50% than usual. We assume that each wafer is \$1000, the price of single 16Gb DIE will reduced from \$1.3 to \$0.84.

### Various manufacturers 16Gb DIE Cost Analysis

Manufacturers	Part Number	yields forecast	DIEs/wafer	USD1000/12-inch wafer
Skhynix 20nm MLC	H27UAG8T2CDA-BC	85%	≈1200	≈USD0.97
Micron 25nm MLC	MT29F16G08CBACAL72	95%	≈1100	≈USD0.94
Samsung 27nm MLC	K9GAG08U0F	95%	≈900	≈USD1.31
Samsung 21nm TLC	K9AAGD8U0A	85%	≈1400	≈USD0.84
Sandisk 24nm MLC	SDWFR-16G2D2	90%	≈1250	≈USD0.88
Toshiba 24nm MLC	ET5HL9E-HS	90%	≈1250	≈USD0.88

To all the suppliers, they all want to push the capacity of NAND flash to high-capacity, it is mainly because: firstly, with the decreasing of production cost. 4GB or higher capacity is more competitive and have the driving force to the market. The whole market needs higher capacity is the inexorable trend. Secondly, meet the market needs. Thirdly, With the developing of the technology, Previously, A new NAND flash updates in year and half but now it across two generations in only one year. The consuming of the upstream manufactures relies on the selling of high capacity memory products, and also the consuming of stock will make up the lost from dropping in price. Therefore, upstream manufactures need to reduce the amount of low-capacity NAND flash.

## Micro SD main application field

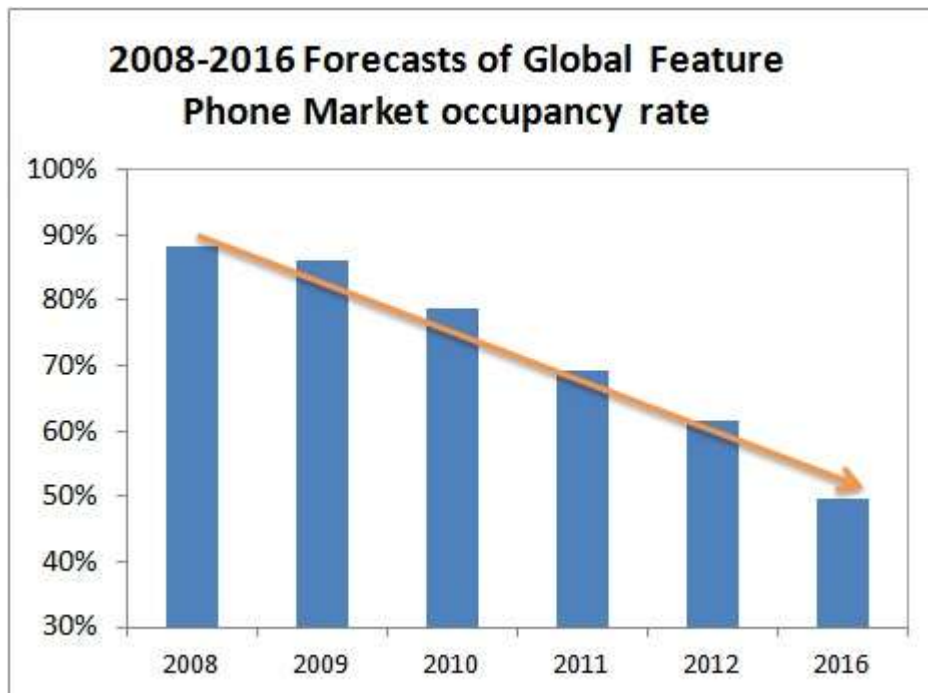
### Mobile phone

#### 1, Functional mobile phone market shrinking

Micro SD is mainly used in mobile phone, as a bundling memory card, 2GB is the standard capacity. In 2011, 1GB Micro SD card is still the main stream but in 2012, 2GB Micro SD card takes place of it. The mainstream of original stop producing 8Gigabit, only LIJING still provides it. For those manufactures which need low-capacity bundling Micro SD card will try to find a better cost effective card instead of 2GB Micro SD card. From the price, storage and also supplier aspects, 4GB or higher capacity Micro SD card is more suitable. For customers expect the Micro SD card with higher quality with acceptable and cheaper price. There is no doubt that under similar budget, customer will choose high-capacity over 2GB Micro SD card.

Since the developing of the smart phone, the situation of mobile phone market has been changed. Last two years, smart phone targeted at high-end products, the reason why it is expensive because the market share is not big enough. But in 2011, mobile phone brands start to push the smart phone market; the market share of feature phone began to be occupied.

#### 2008-2016 Forecasts of Global Feature Phone Market occupancy rate

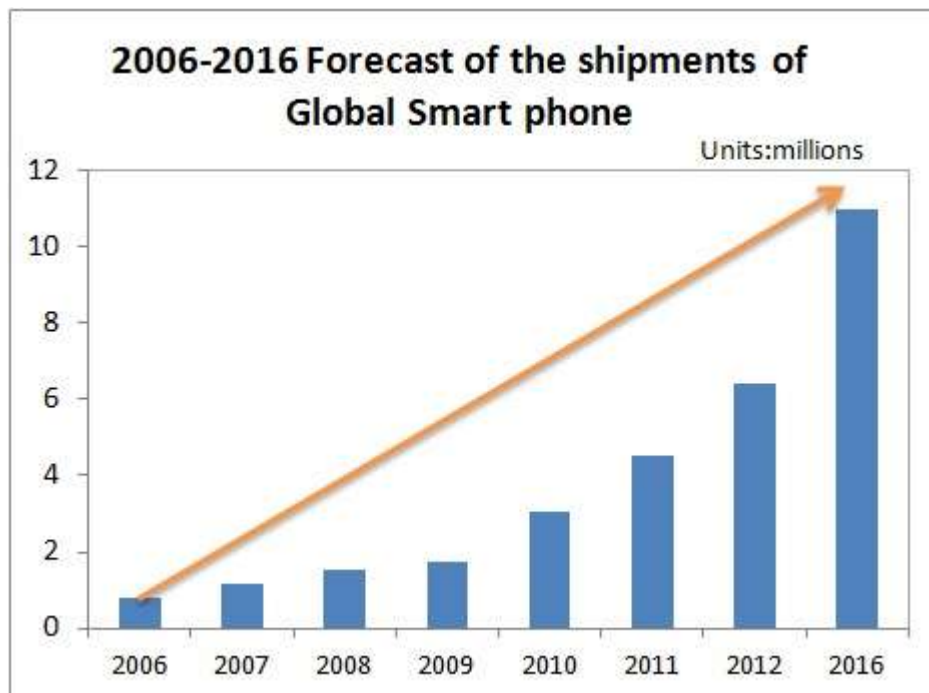


## 2, Smart phone market all out

In 2012, international brand manufacturer like Motorola, Samsung and HTC all launch part of their new products close to one thousand yuan. MTK has released MT6577, the dual-core solution for smart phone, to global cheap smart phone market and planning to pull the price down to around thousand yuan. The retail price of domestic produced thousand yuan 3G smart phone: Huawei C8821, Zhongxing N880E, Coolpad 5860+,Lenovo A7900e Hisense E920 are all around 900 yuan, even smart phone that priced within 500 yuan has also appeared.

Under the propel of the mobile phone manufacturers keep introducing low price smart phone, the market demand of feature phone accelerated atrophy while smart phone experience a explosive growth in 2012. IDC figures showed, the shipments of Global smart phone is 490 million in 2011, increased 180 million compare to 2010, and it is estimated the shipmen twill exceed 600 million in 2012; according to the data released by Ministry of Industry and Telecommunications Research Institute, the shipment of China mobile market in April 2012 is 35.287 million including 18.114 million of smart phone, that is over half of the total shipment. In the growth of mobile market, smart phone is the main driving force so it is inevitable that smart phone surpasses feature phone.

**2006-2016 Forecast of the shipments of Global Smart phone**



The storage capacity of smart phone, the international brand like iphone, Samsung, HTC, they extend their high-end smart phone, usually set 8GB/16GB eMMC+4Gb LPDDR II or above as their embedded storage. That is enough for normal storage, if need external storage, they may need at least 4GB capacity or more. Android system smart phone priced around 1000yuan or below, usually set 4Gb SLC +4Gb LPDDR I as the embedded storage, it is not enough to have 2GB storage capacity for a smart phone.

### Memory size requirement of different kinds of Smart Phone applications

Plane/Virtual navigation				photo	music	game	apps	video
region	Navigation	Baidu (detail/offline)	AutoNavi Careland	300 photos ≈300MB	100 songs ≈400MB	10 games ≈230MB	15 apps ≈150MB	2 videos ≈700MB
	Guangdong China	≈76.5MB	≈188MB	≈328MB				
	China (Mainland)	≈1.2GB	≈1.94GB	≈2.73GB				

Based on the table, install a navigation device will need more than 1GB capacity, plus photos, music, video, and two high-definition movies, 2GB storage is far not enough, a 720 HD movies take up 1GB or more flash memory, 2GB is stretched as external flash memory card extension. Now, the mobile phone navigation is standard smart phone applications for consumers in terms of the use of smart phones, built-in storage capacity has been unable to meet the demand.

NAND flash Micro SD Card can make up for the lack of capacity; However, configuration with any capacity below 2GB will not solve the problem of small storage capacity, only higher capacity (4GB,8GB) flash memory card can meet the demand, so of course consumers will shift to high-capacity storage products.

Furthermore, the SD card capacity within camera is also facing the problem of not meeting consumer demand. Now, a general million pixel photos takes about 4MB of space, a 2GB memory card can only keep 500 pictures that would just run out within 2 days for people on the trip, and it is disappointing to delete any part of it. Therefore, there is no maximum storage capacity for the consumers now, only better.

### Tablet PCs, MP3/MP4s, Navigators and other end-use applications

Micro SD cards are also utilized in cheap tablet PCs, MP3/MP4s, e-books, navigators and other end-use devices. However, the demanding of these devices towards the storage is either relatively higher or narrower and thus would not use products that have 2GB or lower storage capacity basically or it does not help much in terms of the sales on 2GB products. At present, tablet PCs and MP4s require high definition decoding. 1080P is becoming the standard decoding configuration and 720P is the standard storage configuration. Therefore, 2GB storage capacity is far insufficient. It outlines the storage requirements the video requests towards the NAND FLASH:

Standard	480P VCD	576P DVD	720P HD TV	1080P BlueRay DVD
Time				
60 Minutes	300MB	500MB	1.2GB	10GB

## 2GB and low-capacity products still have certain values

The 2GB capacity is about to be eliminated by the main market of mobile storage, which doesn't mean that, however, 2GB capacity would have no space for development in the market. It is likely that some low capacity memory cards would replace those storage media which are not environmentally friendly and easily damaged such as CD and VCD. This could be reflected through system drivers, games, music albums and e-books etc. These markets are quite sensitive to the prices and depend on how strong the factory would support for 2GB products. Eventually, market for Micro SD 2GB would die away gradually.

### From Editor

The development of 2GB products which is from entry to the main market, domination of and then fading out from the market forms a regular pattern of the new replacing the old. In the near future, the mainstream storage will be confronted with the destiny of 2GB which is withdrawing from the main market gradually, during which, time would be one of the promoters and would see all this happens.

## Contact us:

ShenZhen Flashmarket Information Co., Ltd .	
Tel: +86755 86133027	Fax: +86755 86185012
Email: Service@Chinaflashmarket.com	www.chinaflashmarket.com