

Greater China Smartphone Sector

The more the merrier: multi-cameras are the next mega trend in smartphones

- We expect the number of smartphones fitted with dual-cams to reach 230m in 2017E and 390m in 2018E, from just 10m in 2015
- Rise in augmented reality-related applications should further increase the number of cameras adopted in smartphones in the long term
- Positive impact for the smartphone camera components supply chain; Largan and Sunny Optical are our top picks

Negative Neutral Positive



Positive
(unchanged)

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What's new: We provide our first forecasts for dual-camera penetration as we reiterate our optimistic view on camera spec upgrades. We stick with our stance that Largan (3008 TT, TWD3,510, Buy [1]) and Sunny Optical (2382 HK, HKD30.90, Outperform [2]) will benefit the most from this trend within the Greater China smartphone space.

What's the impact: Dual-cams just the start of the multi-camera era. We reiterate our optimistic view on the dual-cam trend for smartphones, as we see the enhanced camera function being one of a smartphone's most compelling selling points (see "[Eyeing spec upgrade trends](#)", 10 May 2016). The adoption of dual-cams should resolve the problem of smartphones having to sacrifice form factor for image quality, or vice versa, and kick off the era of multi-camera adoption in smartphones, in our view.

In addition to Huawei, we expect the major China brands (Xiaomi, LeTV, Oppo, Vivo, etc) to release dual-cams models in 2H16-1H17. Also, we expect the iPhone 7 Plus (due in September) to set a new standard in dual-cams by providing an optical zoom function, which should appeal to consumers and speed up the adoption process. For 2017, our research suggests that not only is Samsung Electronics (SEC) likely to adopt dual-cams in its flagship model in 1H17, but that Apple is also going to adopt dual-cams for all new iPhones in 2H17. In total, we forecast the number of smartphones equipped with dual-cams to grow to 230m in 2017E and 390m in 2018E, from 60m in 2016E and just 10m in 2015.

Look beyond image quality. We see dual-cams as a start of multi-cameras being adopted in smartphones. Multi-cameras can provide good 3D image mapping and modelling, by capturing multiple images and tracking objects' motions, which could extend camera functions to augmented reality (AR), in addition to enhanced image quality. Our market research suggests that the recently announced Phab2 Pro, co-created by Lenovo and Google, will be available in 3Q16, and target to provide an AR function by adopting 3 rear cameras. Our research also shows that Apple is putting resources into AR-related smartphones. The rising popularity of AR applications, such as Pokémon Go, is also likely to accelerate the adoption of multi-cameras, providing further revenue upside.

What we recommend: In our view, the emergence of the multi-cam trend will benefit the overall camera components supply chain, particularly the leaders, and thus we reiterate our Positive sector view. We see **Largan**, the leader in high-end lens sets, and **Sunny Optical**, the major camera module and lens set provider, being the major beneficiaries of this theme and they remain our top picks in the Greater China smartphone space. Key risk: weaker-than-expected dual-cam adoption.

How we differ: We believe we are more optimistic than the market on the adoption of dual-cams in tier-one smartphone brands in 2017-18E.

Key stock calls

	New	Prev.
Largan Precision (3008 TT)		
Rating	Buy	Buy
Target	4,200	3,700
Upside	▲ 19.7%	
Sunny Optical Technology (2382 HK)		
Rating	Outperform	Outperform
Target	34.00	29.00
Upside	▲ 10%	

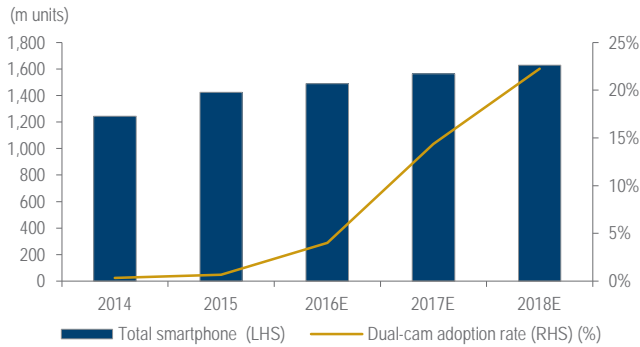
Source: Daiwa forecasts

Sector stocks: key indicators

Company Name	Stock code	Share Price	Rating		Target price (local curr.)			EPS (local curr.)					
			New	Prev.	New	Prev.	% chg	FY1			FY2		
								New	Prev.	% chg	New	Prev.	% chg
Largan Precision	3008 TT	3,510	Buy	Buy	4,200	3,700	13.5%	175.218	175.218	0.0%	255.283	225.568	13.2%
Sunny Optical Technology	2382 HK	30.90	Outperform	Outperform	34.00	29.00	17.2%	1.020	1.020	0.0%	1.384	1.271	8.9%

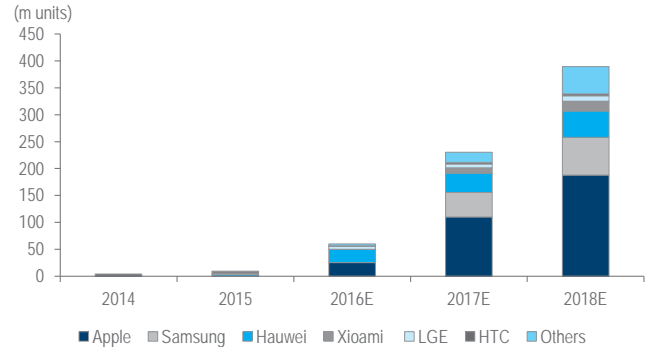
Source: Bloomberg, Daiwa forecasts

Greater China Smartphone Sector: the dual-cam penetration of smartphones



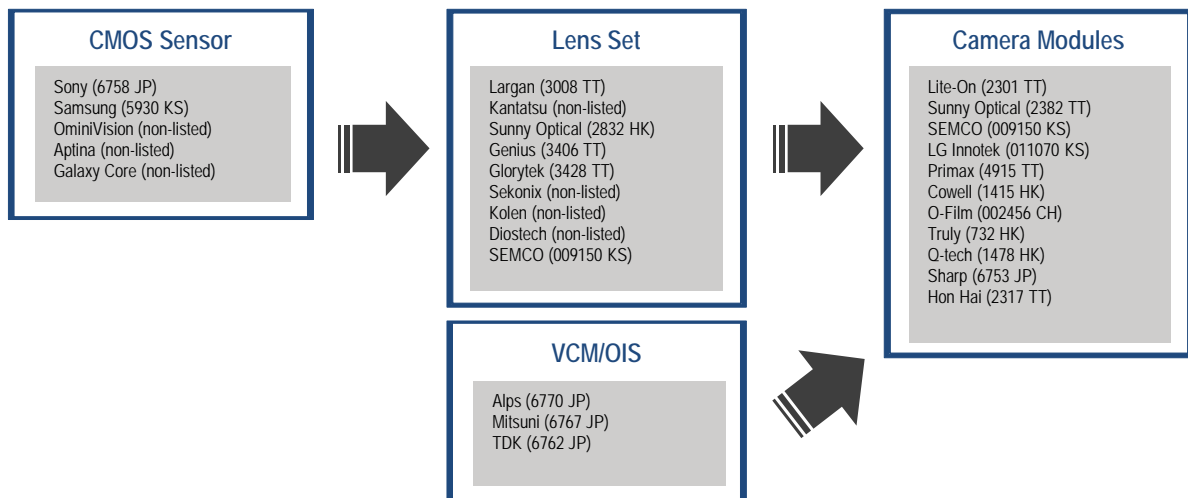
Source: Daiwa estimates and forecasts

Greater China Smartphone Sector: dual-cams adopted in smartphones by brand



Source: Daiwa estimates and forecasts

Smartphone camera module supply chain



Source: Companies, Daiwa

Table of contents

Multi-cameras: the next mega trend for smartphones	4
Dual-cams: taking smartphone cameras to the next level	4
Adoption of dual-cams set to accelerate in 2017-18E	5
Dual-cams: major types and benefits to image quality	7
The more the better – look beyond the image quality	10
Positive on the camera components supply chain – valuations and recommendations	14
 Company Section	
Largan Precision	16
Sunny Optical Technology	20

Multi-cameras: the next mega trend for smartphones

We see the adoption of dual-cams as an emerging mega trend in the smartphone space, which will enhance image quality significantly in the coming years

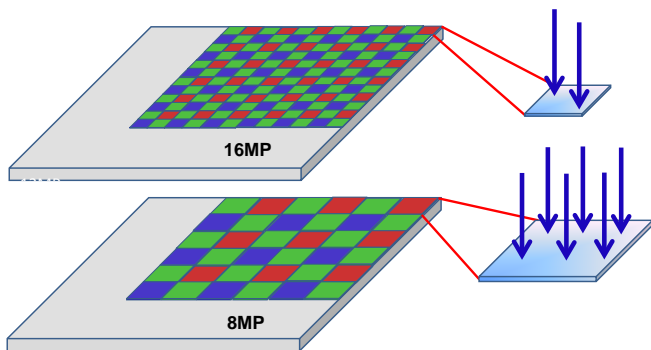
Dual-cams: taking smartphone cameras to the next level

As the smartphone industry is moving into the saturated stage, with limited sales volume growth on the back of high smartphone penetration, the smartphone OEMs are having to find ways to differentiate their products to gain consumers. Of all the functions of a smartphone, cameras have been one of the key features that consumers have paid attention to, and the brand vendors have focused on for upgrades. However, the nature of a smartphone's form factor design, in particular the thickness requirement, has made it a challenge to improve image quality, which is a combination of megapixel count, aperture ratio, pixel size, sensor size, etc.

Typically, a larger CMOS sensor, bigger pixel size, or more lens components in a lens set should allow more light into a camera module to catch more details of a subject, resulting in better image quality. However, this has also meant a bulky camera module with a higher Z-height (the height of the camera module) due to the increased size or pieces of the optical components. Thus, there is always a trade-off between better image quality and a thinner form factor design for a smartphone.

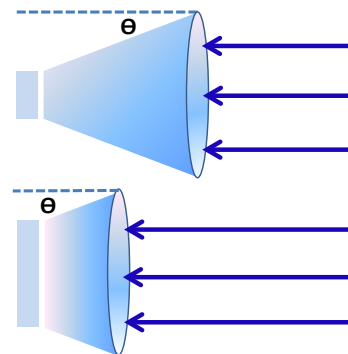
This dilemma has become a more important issue since smartphone cameras migrated to higher resolutions (higher pixel count). Due to space constraints in a smartphone, the image quality of 16MP+ camera modules could be worse than for phones with 8MP-12MP camera modules, because the pixel size becomes too small to ensure good light sensitivity. On the other hand, assuming other criteria stay the same (such as field of view, sensor size, the level of design difficulty, etc), higher resolution requires longer focal length due to the smaller pixel size and results in a higher Z-height for the camera module.

The trade-off between light sensitivity and pixel size



Source: Companies, Daiwa

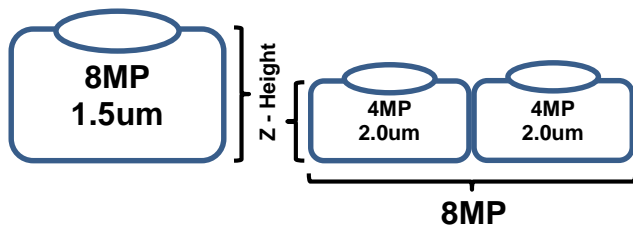
Smaller pixel size results in thicker camera modules



Source: Companies, Daiwa

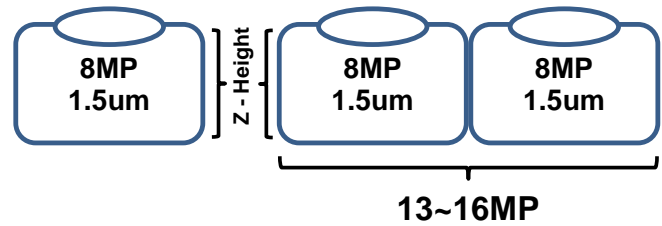
The emergence of dual-cams is a solution to this dilemma, in our view. Having a dual-cam in a smartphone means that it has 2 cameras on the back of the phone to take pictures/shoot film instead of just 1 camera, which is the current design adopted by most phones. By incorporating 2 channels to collect picture details/light, phones with a dual-cam design can reduce the z-height (the thickness of the camera module) significantly but deliver a similar or even better performance than a single cam. Dual-cam smartphones can offer higher resolution and better image quality compared to single-cam models, and are thinner as well.

Dual-cam design can reduce the thickness of camera module



Source: Companies, Daiwa
 Note: Z-height: the depth of a camera module

Dual-cam design can improve camera image quality, with a camera module that is as thick, or thin, as a single-camera module



Source: Companies, Daiwa
 Note: Z-height: the depth of a camera module

We forecast a dual-cam adopted smartphone volume CAGR of 156% over 2016-18E

Adoption of dual-cams set to accelerate in 2017-18E

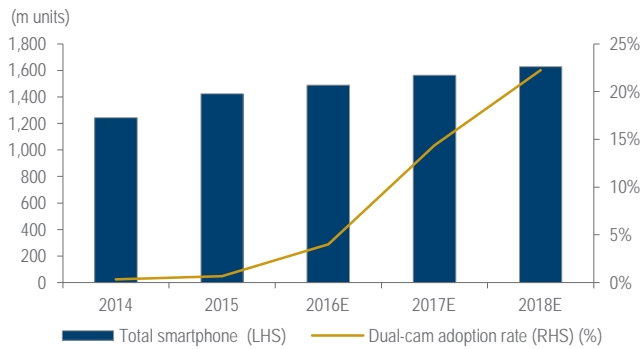
We reiterate our enthusiasm over camera-spec upgrades in the smartphone space, as we believe the enhanced camera function is one of the key selling points that customers look for, as discussed in "[Eyeing spec upgrade trends](#)", published on 10 May 2016.

In addition to mega pixel migration, the inclusion of OIS, the increase of aperture ratio or sensor size, etc, we believe dual-cams will be the key upgrade trend in the coming years, and should mark the unveiling of the era of multi-cams in smart devices. The adoption of dual-cams started attracting consumer attention in early-2014 when HTC introduced a dual-cam in its flagship model, the HTC One M8. Unfortunately, due to the immature nature of the hardware and software capability at that time, the image quality delivered by the M8 failed to meet consumer expectations.

Not surprisingly, over the past 2 years, the smartphone brand makers have spent more resources on dual-cam designs and have overcome the main technological bottlenecks, based on our supply-chain research. We expect 2016 to be the year that marks the kick-off of dual-cams being adopted in smartphones. In addition to Huawei, which has been one of most aggressive brands to incorporate dual-cams, launching 3 dual-cam smartphones (the P9, Honor V8, and Honor 8) in 1H16, we expect the other major China brands, including Xiaomi, Oppo, Vivo, LeTV, to release dual-cam models over 2H16-1H17. More importantly, the iPhone 7 Plus, expected to be released this September, is likely to adopt 12MP+12MP dual-cams with optical zoom function (see [12MP + 12MP likely for iPhone 7 Plus](#)) to gain consumer attraction and speed up the adoption of dual-cams. As a result, we forecast the number of smartphones equipped with dual-cams to rise to 230m in 2017E, with a penetration rate of 4%, from 10m (or a penetration rate of 0.7%) in 2015

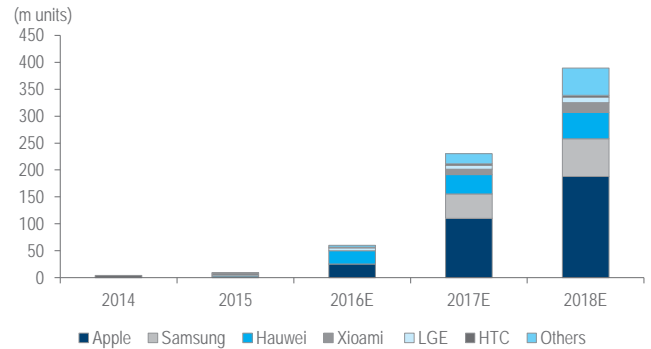
Looking into 2017, our supply-chain research indicates that: 1) SEC is likely to adopt dual-cams in its flagship model in 1H17, 2) Apple is likely to adopt dual-cams for all new iPhones in 2H17 (in addition to the 5.5" model in 2H16), and 3) Huawei plans to increase its dual-cam adoption, with more of the China brands to follow. We believe the adoption of dual-cams by these tier-1 top brands will accelerate the penetration of dual-cams in smartphones, and expect all the major smartphone brands to release at least 1 dual-cam model in 2017. As a result, we expect the number of smartphones fitted with dual-cams to grow to 230m in 2017E and 390m in 2018E, vs. 60m in 2016E and 10m in 2015, which implies a CAGR of 156% over 2016-18E.

Dual-cam penetration in smartphones



Source: Daiwa estimates and forecasts

Dual-cams adopted in smartphones by brand











Source: Daiwa estimates and forecasts

Major dual-cam models in 1H16

Model	1H16					
	LG G5	LG G5 SE	Huawei P9	Huawei P9 Plus	Huawei Honor V8	Huawei Honor 8
Model Picture:						
Dimensions:	149.4 x 73.9 x 7.7 mm	149.4 x 73.9 x 7.3 mm	145 x 70.9 x 7 mm	152.2 x 75.3 x 7 mm	157 x 77.6 x 7.8 mm	145.5 x 71 x 7.5 mm
Weight:	159 g	156 g	144 g	162 g	170 g	153 g
Embedded OS:	Android OS, v6.0	Android OS, v6.0.1	Android OS, v6.0	Android OS, v6.0	Android OS, v6.0	Android OS, v6.0.1
Cellular Data Links:	GSM / HSPA / LTE	GSM / HSPA / LTE	GSM / HSPA / LTE	GSM / HSPA / LTE	GSM / HSPA / LTE	GSM / HSPA / LTE
CPU:	Qualcomm Snapdragon 820	Qualcomm MSM8976 Snapdragon 652	HiSilicon Kirin 955	HiSilicon Kirin 955	HiSilicon Kirin 950/955	HiSilicon Kirin 950
CPU Clock:	2.15/1.6 GHz	1.8/1.2GHz	2.5/1.8 GHz	2.5/1.8 GHz	2.3 (2.5)/1.8 GHz	2.3/1.8 GHz
ROM capacity:	32GB	32GB	32/64GB	64GB	32/64GB	32/64 GB
RAM capacity:	4GB	3GB	3/4GB	4GB	4GB	3/4 GB
Display Diagonal:	5.3"	5.3"	5.2"	5.5"	5.7"	5.2"
Display Resolution:	1440 x 2560 pixels	1440 x 2560 pixels	1080 x 1920 pixels	1080 x 1920 pixels	1080 x 1920/1440 x 2560 pixels	1080 x 1920 pixels
Pixel density:	554 ppi	554 ppi	423 ppi	401 ppi	386/515 ppi	424 ppi
Camera resolution:	16MP + 8MP	16MP + 8MP	12MP + 12MP	12MP + 12MP	12MP + 12MP	Dual 12MP
Sensor size:	-	-	-	-	1.25 µm	-
Pixel size:	-	-	1.25 µm	-	-	1.4 µm
Aperture:	f/1.8 + f/2.4	f/1.8 + f/2.4	f/2.2	f/2.2	f/2.2	f/2.2
OIS:	Yes	Yes	No	No	No	No
Secondary Camera:	8MP	8MP	8MP	8MP	8 MP	8MP
Battery Capacity:	2800 mAh	2800 mAh	3000 mAh	3400 mAh	3500 mAh	3000 mAh
Launched date	Feb-16	Apr-16	Apr-16	Apr-16	May-16	Jul-16
Price	USD689	USD649	-	-	USD430	-
CNY/INR Price	-	-	CNY3,188	CNY3,988	CNY2,299	CNY1,999 / CNY2,499

Source: Companies, Daiwa

Major dual-cam models released in 2014-15

	2014				2015			
Model	New HTC One M8	HTC Butterfly 2	Huawei Honor 6 Plus	HTC One M9+	HTC Butterfly 3	QiKU Terra	Lenovo Vibe S1	LG V10
Model Picture:								
Dimensions:	146.4 x 70.6 x 9.4 mm	145.4 x 70.2 x 10 mm	150.5 x 75.7 x 7.5 mm	151 x 72 x 9.6 mm	151 x 73 x 10.1 mm	157.6 x 79.8 x 8.6 mm	143.3 x 70.8 x 7.8 mm	159.6 x 79.3 x 8.6 mm
Weight:	160 g	151 g	165 g	168 g	162 g	207 g	132 g	192 g
Embedded OS:	Android OS, v4.4.2	Android OS, v4.2.2	Android OS, v4.4.4	Android OS, v5.0.2	Android OS, v5.0.2	Android OS, v5.1	Android OS, v5.0	Android OS, v5.1.1
Cellular Data Links:	GSM/ HSDPA/ LTE	GSM/ HSDPA/ LTE/ TD-LTE	GSM/ HSDPA/ LTE	GSM/HSPA/ LTE	GSM/HSPA/ LTE	GSM/ HSPA/ LTE	GSM/ HSPA/ LTE	GSM/HSPA/ LTE
CPU:	Qualcomm MSM8974AB Snapdragon 801	Qualcomm Snapdragon 801	HiSilicon Kirin 925	Mediatek MT6795T	Qualcomm MSM8994 Snapdragon 810	Snapdragon 810	Mediatek MT6752	Qualcomm MSM8992 Snapdragon 808
CPU Clock:	2.3 GHz	2.5 GHz	1.8 GHz	2.2 GHz	1.5/ 2.0 GHz	2.0 GHz	1.7 GHz	1.44/ 1.82 GHz
ROM capacity:	16GB	16/36GB	16GB/32GB	32GB	32GB	16GB	32GB	64GB
RAM capacity:	2GB	2GB	3GB	3GB	3GB	3GB	3GB	4GB
Display Diagonal:	5.0"	5.0"	5.5"	5.2"	5.2"	6.0"	5.0"	5.7"
Display Resolution:	1080 x 1920 pixels	1080 x 1920 pixels	1080 x 1920 pixels	1440 x 2560 pixels	1440 x 2560 pixels	1080 x 1920 pixels	1080 x 1920 pixels	1440 x 2560 pixels
Pixel density:	441 ppi	441 ppi	401 ppi	534 ppi	565 ppi	497 ppi	441 ppi	515 ppi
Camera resolution:	dual - 4MP (UltraPixel)	Dual 13MP	8MP	20.7MP + 2.1MP dual	20.2 + 20.2MP	13+13MP	13MP	16MP
Sensor size:	1/3"	1/3.06"	-	1/2.4"	1/2.4"	1/3.08"	-	1/2.6"
Pixel size:	2.0 μm	1.1 μm	1.98 μm	1.1 μm	1.097 μm	1.127 μm	-	1.12 μm
Aperture:	f/2.0	f/2.0	f/0.95 - 16.0	f/2.2	f/2.2	f/2.0	-	f/1.8
OIS:	No	No	No	No	No	No	No	Yes
Secondary Camera:	5MP	5MP	5MP	4MP UltraPixel	13MP	8MP	8MP+ 2MP	5+5MP
Battery Capacity:	2600 mAh	2700 mAh	3600 mAh	2840 mAh	2700 mAh	3700 mAh	2500 mAh	3000 mAh
Launched date	Mar-14	Aug-14	Dec-14	Apr-15	Jun-15	Aug-15	Sep-15	Oct-15
Price	USD599-649	USD690	USD320/USD400	-	USD600	-	USD299	USD599
CNY/INR Price	-	-	CNY1,999/CNY2,499	CNY4,999	-	CNY1,999	-	KRW500,500

Source: Daiwa

Major benefits of dual-cams include: multiple focus/post-shot focus adjustments, better image quality in low-light environments, improved resolution/pixel quality, etc

Dual-cams: major types and benefits to image quality

What are the benefits of dual-camera design?

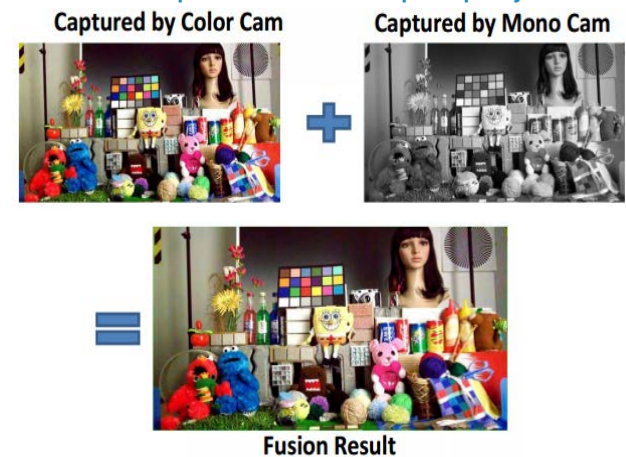
In addition to reducing the thickness/height of the camera module to create a thinner form factor for smartphones, dual-cams can improve image quality in different areas by leveraging the different characteristics of each camera. The major benefits of dual-cams include multiple focus/post-shot focus adjustments, a better image quality in low-light environments, improved resolution/pixel quality, optical zoom function, and 3D depth mapping.

Dual camera: multiple focus/post-shot focus adjustments



Source: Corephotonics, Daiwa

Dual camera: improved the resolution/pixel quality



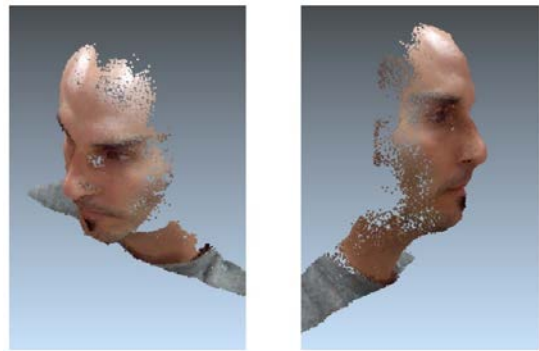
Source: Altek, Daiwa

Dual camera: optical zoom function



Source: Companies, Daiwa

Dual camera –3D depth mapping



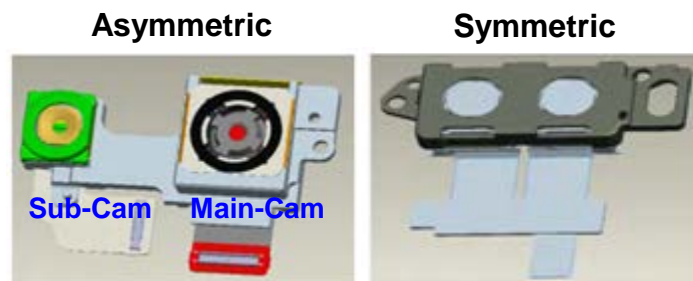
Source: Companies, Daiwa

Of all the major types of dual-cam, we view the twin type-telephoto camera + wide-angle camera as the most advanced, and the one that can provide the optical zoom function

The structure of a dual-camera and the major types

There are 2 different structures for dual-camera designs: asymmetric and symmetric. The asymmetric structure is when the two cameras are not identical in resolution or sensor size. An asymmetric structure creates an image with a different visual focus in order to simulate dimensional effects. The symmetric structure, on the other hand, is equipped with the same 2 resolution cameras side by side. Under these 2 structures, we can categorise the current dual-cam designs into 4 major types: 1) Identical type – high resolution (colour) + high resolution (colour), 2) Twin type – high resolution (mono) + high resolution (colour), 3) Twin type – telephoto camera + wide-angle camera, and 4) Depth type – high resolution + low resolution. Each type has its strength in image quality improvements (see the table on page 9) and the design for each is discussed in detailed below.

The dual-cam structure



Source: Altek, Daiwa

Identical type: high resolution (colour) + high resolution (colour): this design refers to a dual-cam module with two identical cameras – the same specs for the CMOS sensor and lens, placed side by side. The Huawei Honor 6+ adopts this design.



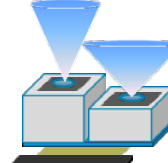
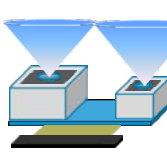
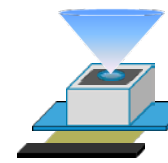
Twin type: high resolution (mono) + high resolution (colour): the dual-cam module has 2 cameras with the same pixel count, yet one adopts a monochrome sensor and the other adopts a colour sensor. The monochrome sensor captures all incoming light with each pixel so it is more sensitive than the colour sensor. As a result, the monochrome sensor is able to achieve a higher resolution and better low-light performance. The Huawei P9, Honor V8, Honor 8 and Qiku Terra adopt this design.

Twin type: telephoto camera + wide-angle camera: the dual-cam module has 2 cameras with the same pixel count and the same colour sensor, but different focal length for each. Under this design, 2 cameras can work together and each comprises a different “optical package” (wide-angle and telephoto) with different “focal length” to create an optical zoom option. We consider this to be the most advanced dual-cam design due to the high requirements in terms of algorithm/software capability from the complexity of the data-

processing involved. There is no smartphone model available with this design yet but we expect the coming iPhone 7 Plus to adopt it.

Depth type: high resolution + low resolution. A depth type dual-camera design usually includes a main camera (higher resolution) and a sub-camera (lower resolution). The main camera captures the main subjects in the visual field and the sub-camera records the depth information. Together they simulate a dimensional effect and create pictures with different areas of focus. HTC's M8, M9+ and LG G5 adopt this design.

Image quality and form factor comparisons – different types of dual-cams and single cam

Structure	Dual-cam Symmetric			Dual-cam Asymmetric	Single camera
Resolution	High + High	High + High	High + High	High + Low	Colour
CMOS sensor	Colour + Colour	Colour + Mono	Colour + Colour	Colour + Colour	Colour
Focal length	Same	Same	Telephoto + Wide-Angle	Depends	
Camera Module Structure					
Thickness of camera module	Thinner	Thinner	Thinner	Thinner	Thicker
Optical zoom	n.a	n.a	★★★★★	★	n.a
Low-light image quality	★★★	★★★★★	★★★★★	★★	★
Improved resolution/ Pixel quality	★★★	★★★★★	★★★★★	★★	★
3D depth mapping	★★★★★	★★★★★	★★★★★	★★★	n.a
Multiple focus / Post-photo adjustments	★★★	★★★	★★★★	★★★★★	★

Source: Companies, Daiwa

We expect the upcoming iPhone 7 Plus to adopt a dual-cam design with optical zoom function to gain consumer attention and speed up dual-cam adoption

iPhone 7 Plus likely to set a new standard for dual-cams

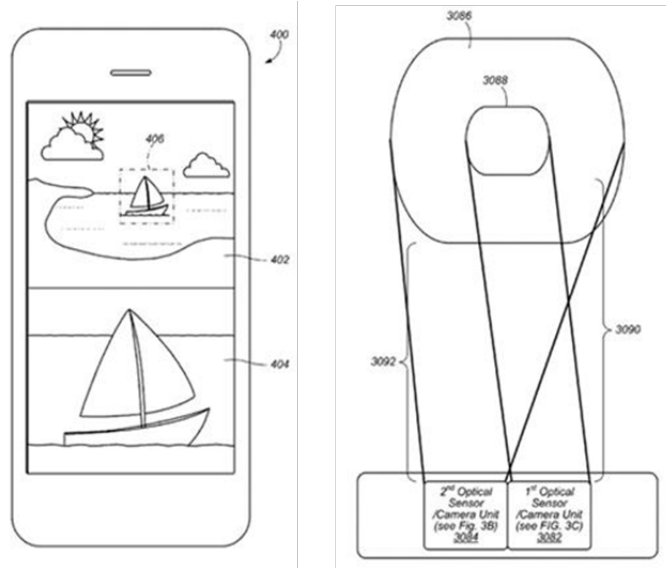
We expect the coming iPhone 7 Plus to adopt 12MP+12MP dual-cams. More importantly, our supply chain research indicates this model will adopt a “twin type – telephoto camera + wide-angle camera” design to provide an optical zoom function. This would be the first smartphone with an optical zoom function, which we expect to gain consumer attention and speed up dual-cam adoption.

In addition, we see the model offering improved video recording on top of the enhancement of image quality, according to Apple’s patent “dual camera zoom system”, granted in January 2016. In the patent, Apple demonstrates the benefits of a dual-camera design, including:

- 1) Producing an optical zoom effect for the entire picture. Rather than losing clarity of one or more objects when zooming in on an image, dual cameras create a clearer image of both near and far field objects. Moreover, 2 cameras with different focal points can also produce images with depth of field, 3D imagery, or help with lighting even in poorly-lit environments.
- 2) Taking a better picture during a video capture. Although it has been possible to take still photos while shooting video since the iPhone 5, the stills are captured at a lower-than-normal resolution. With twin camera modules, maximum resolutions for both video and images can be captured.
- 3) The mechanism of dual-camera design provides the capability of recording videos with different resolutions and recording videos at the same or two different speeds simultaneously, for example slow-motion capture.

In the patent filing, Apple outlines a few specific examples to exemplify the real-life uses of dual cams. In one instance, Apple describes a child celebrating a birthday by blowing out candles on a birthday cake. Dual cams allow taking a video of an entire crowd while shooting a close picture of the birthday child blowing out the candles simultaneously and combining the video and picture into one single file afterward. In the other example, a fan at a baseball game is able to capture a slow-motion batting moment while video-shooting the entire field at the same time and combining them into one single file after.

Demonstration of a dual-cam design in Apple's patent



Source: Apple, Daiwa

The more the better – look beyond the image quality

We view the rising popularity of AR applications as the main reason for the increase in the number of cameras to be adopted in smartphones in the long term

We view dual-cams as just the beginning of multi-camera adoption in smartphones. Multi-cameras can provide good 3D image mapping and modelling by capturing multiple images and tracking objects' motions, which can extend camera functions to AR, in addition to the enhancement of image quality. Google's Project Tango targets mobile devices to carry AR functions by adopting a trio-camera design. The recently released Lenovo Phab 2 Pro is the first smartphone under Project Tango.

Our supply chain research also indicates Apple is allocating resources to creating smartphones for AR. This is evidenced by Apple's acquisition in 2015 of Metaio, an AR company that develops software technology and provides AR solutions, as well as CEO Tim Cook's comments at its analyst meeting on 26 July that AR could be huge, and that Apple would continue to invest a lot in it, seeing it as a start to broaden cameras on smartphones beyond image quality. In addition, the success of AR applications – particularly the AR game, Pokémon GO – should increase attention on smartphone-AR concepts and accelerate multi-camera adoption in smartphones. We have not yet factored in the benefits of this into our earnings models for the companies we cover.

Project tango, developed by Google's advanced technology and project (ATAP) department, requires 3 cameras on the back of a mobile device to provide AR functions

Project Tango

Project Tango is a new technology developed by Google's advanced technology and project (ATAP) department that allows a mobile device to piece together 3D maps of the surroundings, perceiving the world in much the same way that humans do. The device is able to identify position relative to the surrounding area without using GPS or other external signals. Project Tango's development kit is equipped with an infrared camera, an integrated depth sensor, a motion tracking camera which has a 180-degree fish-eye lens allowing for 180-degree tracking, and an infrared projector. In total, the device needs 3 cameras on the back of it.

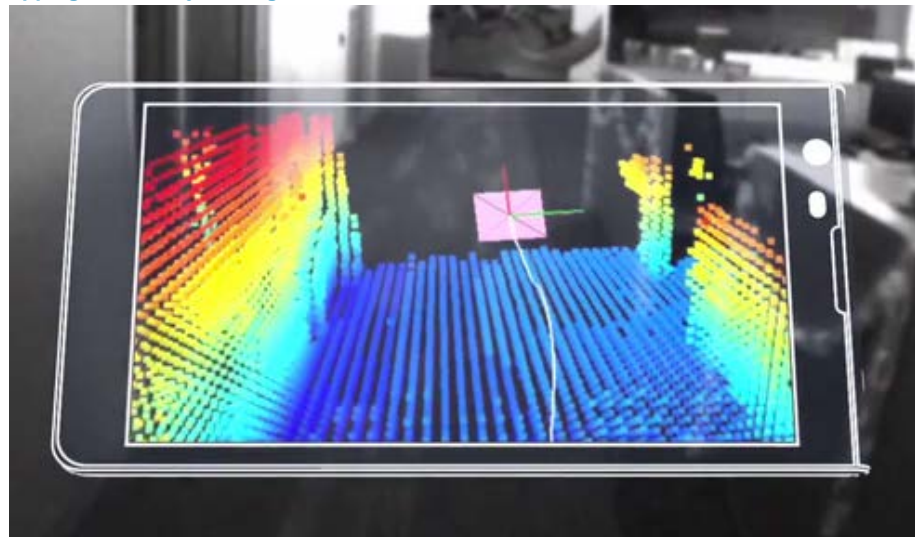
The device uses time of fly (ToF) methodology to create 3D mapping of the surrounding world. By plotting infrared point clouds using an infrared projector, it gives coordinates of surroundings with each point representing a value of distance related to the device. The infrared wave bounced back is then received by the infrared camera to compute depth information. This allows the device to perceive position and space by analysing the distance between points in an area that is not in the same frame. The combination of cameras and sensors gives the device 3 types of functionality, ie, motion tracking, area

learning, and depth perception – motion tracking permits a device to understand position and orientation which gives real time information about the 3D motion of a device.

Moreover, area learning, by using stored environment data and disparate data as visual cues to help recognise the surrounding environment, this allows the device to perform self-correct errors in motion tracking and re-localise an area that the device has seen before. Finally, depth sensors tell the shape of the surrounding environment by capturing infrared information using an infrared camera and infrared projector. The depth perception allows AR for users to interact with the world.

Developers can use Project Tango for different applications, for instance to create AR applications/games. Developers working with tango can create an app that helps users navigate around a shop or try on outfits, taking online shopping to the next level. Moreover, an app can track the size of the surroundings and turn it into shooting game warfare or an environment to interact with users. We see substantial market potential for Project Tango, which could facilitate the growth of AR development and further benefit AR-related companies.

3D mapping under Project Tango



Source: Google, Daiwa

Lenovo Phab 2 Pro

In June 2016, Lenovo announced it was planning to launch the world's first Tango-enabled smartphone, the Phab 2 Pro. The phone has 4 cameras, including an 8MP front-camera for taking selfies, and 3 back-cameras to support the phone's Tango features. It also has a 16MP RGB camera with a Tri-LED layout, assisted by an ultra-wide fisheye lens to get a wide view of the space and a separate depth sensor that calculates the time required by light to travel between an object and the lens for 3D mapping. The hardware enables the Phab 2 Pro to deliver an augmented reality experience with Tango technology by allowing users to scan the environment and mix virtual items with the real world.

Google also has plans to have 25 Tango-specific apps in the Play Store upon the launch of the Phab 2 Pro phones. With the Tango-enabled Phab 2 Pro, it would not be a surprise to us if users started using their smartphones to measure their home space or play hide and seek with virtual characters. We expect the phone to kick-off a new multi-camera layout trend in the smartphone industry and completely change the user experience.

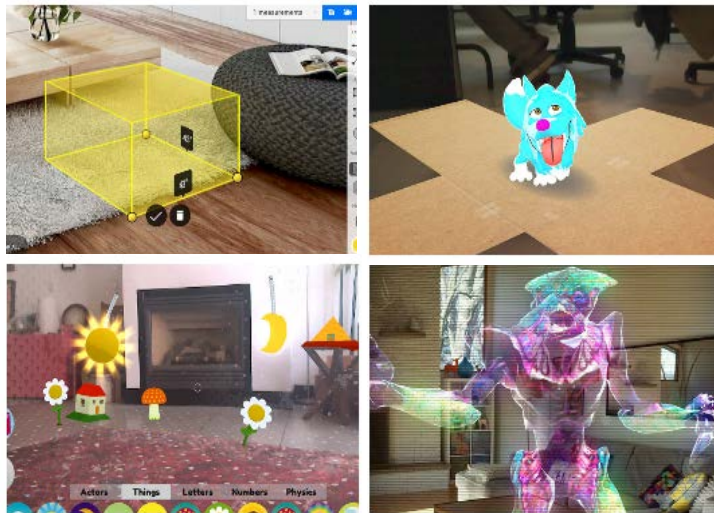
Lenovo Phab 2 Pro will be the first smartphone to adopt the AR function and it is coming in 3Q16. The phone has 4 cameras in total.

Lenovo Phab 2 Pro



Source: Lenovo

Lenovo Phab 2 Pro: augmented reality applications



Source: Companies, Daiwa

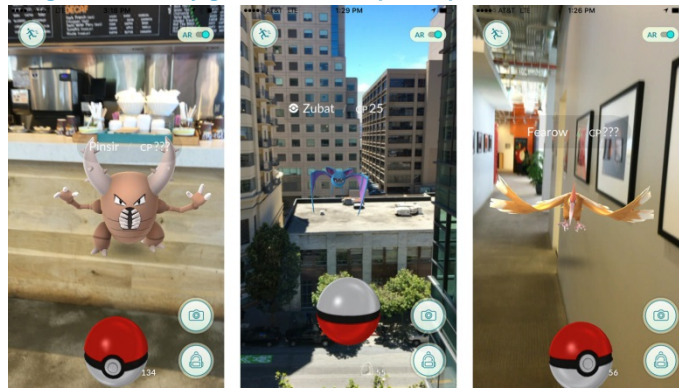
Pokémon Go is the most successful gaming app for smartphones of all time; we believe it will increase the pace of multi-camera adoption

Pokémon Go

Pokémon Go is a chart-topping game globally that uses GPS to locate the players and Pokémon on Google maps; players can collect different kinds of Pokémon in real neighbourhoods. In addition, by turning on the camera, the AR technology allows the Pokémon to appear in the surrounding areas, bringing the Pokémon into the real world. As stated by Pokémon Go players, the addictive part of this game is that it requires players to get up from their sofas and go outside to explore the world of these Pokémon.

On 11 July 2016, Forbes reported that the game was downloaded at least 7.5m times within the first 5 days after its release on 6 July 2016 in the US, accounting for an average of USD1.6m in daily revenue in that country alone. The popularity of Pokémon Go is likely to drive demand for AR functions in smartphones in the long run.

Pokemon Go: an augmented reality game on a smartphone phone



Source: Companies, Daiwa

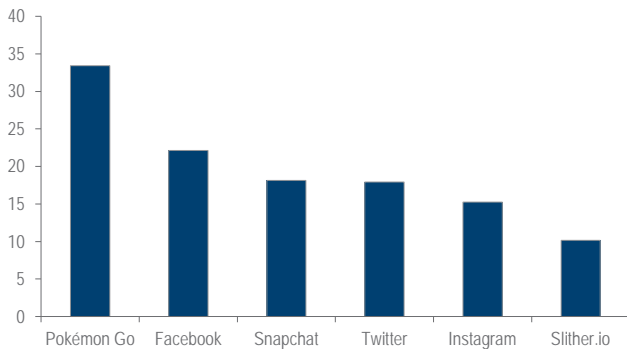
Pokémon Go: popularity

Pokémon Go achievements

Amount of time Pokémon Go took to become the highest-grossing app in the US	13 hours
Amount Nintendo's market value increased in the first 5 days of launching the game	USD9bn
Number of countries the game now has users in	30 countries
Amount of times Pokémon Go was downloaded in the first 2 weeks of launch	30m worldwide
Estimated amount Pokémon Go made in the first day of launching	USD35m
Average Daily revenue contribution in the US	USD1.6m
Peak daily active users (14 July 2016)	25m users
Amount of time Pokémon Go players spend on the app daily	43 minutes
Percentage of Pokémon Go players that are between the ages of 18 and 34	78%

Source: Nintendo, Google, Daiwa

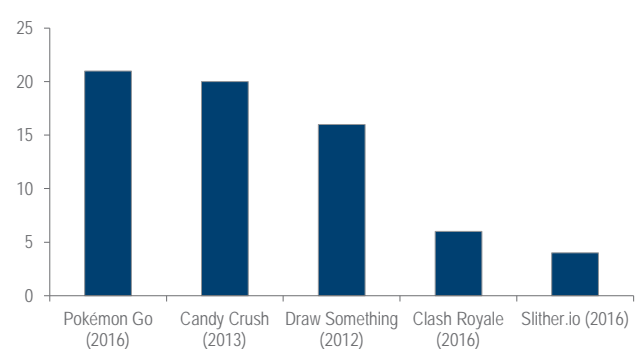
Pokémon Go: daily top mobile apps for iOS users (minutes)



Source: Companies, Daiwa

Note: Data based on the statistics as at 19 July 2016

Pokémon Go: peak daily active users (m)



Source: Companies, Daiwa

Note: Data based on the statistics as at 14 July 2016

Apple's acquisition of Metaio in 2015 is evidence that it is putting resources into AR for smartphones

Apple's augmented reality investment – the acquisition of Metaio

In May 2015, Apple acquired Metaio, a privately-held augmented reality company that developed software technology and provided augmented reality solutions for the retail, industrial and automotive markets. The company created Junaio, an AR browser for both Android and iOS mobile devices. This visual-based localisation technology is used to replace sensor-based localisation. It gives a more precise positioning of points of interests, natural experience via the seamless integration of virtual scene content, and by offering a real impression of distance and occlusion.

In early 2015, prior to the Metaio acquisition, Apple had patented a VR headset compatible with iPhones and started working on an augmented reality feature for its Maps app, which allows users to get detailed information about the surrounding places by pointing their phones. We believe that the AR technology developed by Metaio could help Apple bolster its virtual reality and augmented reality technologies. We believe Apple could also incorporate Metaio's intellectual property into the wide range of potential products, such as mobile handsets or smart-glasses in the future. It is clear from the acquisition that Apple has plans to be in the augmented reality game space for the long term.

Positive on the camera components supply chain – valuations and recommendations

We expect the multi-camera components supply chain to have a positive impact on the overall camera supply chain; in the Greater China Smartphone Sector, Largan and Sunny optical are our top picks

We believe the rise in the adoption of multiple cameras in smartphones will benefit the camera components supply chain, from upstream CMOS sensors to downstream camera modules. For CMOS sensors, the vendors are likely to benefit from an increase in shipment volumes due to the dual-cam adoption trend. For lens sets and camera modules, in addition to an increase in the volume, we expect suppliers to enjoy higher ASPs due to the complexity of producing to higher-spec requirements. Meanwhile, the OCM/VCM vendors should also benefit from the dual-cam adoption on the rising overall demand for high-end camera modules, although the magnitude of any volume and ASP increase could vary due to the different types dual-cam design.

In the Greater China smartphone space, **Largan** and **Sunny** are our top picks under the dual-cam adoption theme. Both names are also 2 of our top picks, along with AAC (2018 HK, HKD71.95, Buy, [1]) in the Greater Smartphone space, driven by the favourable industry specs upgrade trends that we see ahead, as discussed in [Eyeing spec upgrade trends](#), published on 10 May 2016.

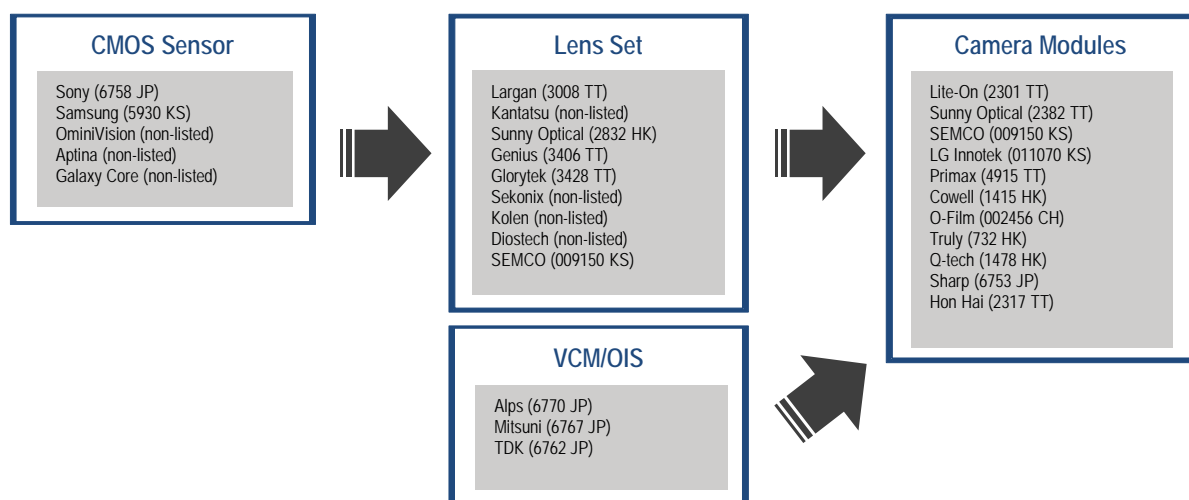
Largan: capitalising on the multi-cam adoption trend

Largan, as the leader in high-end lens sets, should capture the dominate share of the dual-cam markets and enjoy an increase in its ASPs and volumes. To factor in the potential increasing pace of dual-cam adoption in smartphones, we raise our 2017-18E earnings for Largan by 13-18%. We reiterate our Buy (1) rating on the stock and raise our 12-month target price to TWD4,200 (from TWD3,700), based on an unchanged target PER of 18x, which is near the mid-point of the stock's past-5-year range of 8-24x, applied to our revised 1-year-forward EPS.

Sunny Optical: a rosy earnings outlook on favourable industry trends

For Sunny Optical, the benefits of the rising multi-camera trend should come from its handset camera module (via its leading position in the China brands) and handset lens sets (via the increasing demand for high-end lens and spill-over benefits from SEC adopting the dual-cam in 2017E) businesses. We raise our 2017-18E earnings for Sunny by 9-14% to factor in the increasing adoption of dual-cams in smartphones. We reaffirm our Outperform (2) rating and lift our 12-month target price to HKD34 (from HKD29), now based on a target PER of 22x (previously: 21x), which is at the high point of its past-3-year trading range of 9-22x, on our revised 1-year-forward EPS, to factor in the better earnings growth outlook.

Smartphone camera module supply chain



Source: Companies, Daiwa

Risks to our view

The major risk to our sector rating would be weaker-than-expected smartphone sell-through. The high uncertainty surrounding macroeconomics and currency fluctuations, and high smartphone penetration in developed and developing countries could delay the smartphone replacement cycle or new purchases by consumers, which could result in weaker-than-expected smartphone sell-through and lead to slower-than expected revenue growth in the sector.

A secondary risk would be greater-than-expected price competition in the sector. After years of strong volume growth, the smartphone industry has likely entered a saturated stage with single digit YoY volume growth in the coming years, based on our forecasts. The limited volume growth could raise the possibility of fiercer-than-expected price competition in the industry, which could lead to weaker-than-expected gross margins for the companies in the sector.

A third risk would be slower-than-expected dual-cam adoption. Although we believe dual-cams design adoption will rise significantly in the coming years due to the rich benefits the design can provide for image quality enhancement and 3D/AR function, feedback from consumers will likely be key to the final adoption rate. If dual-cam design fails to attract consumers, this could result in slower-than-expected dual-cam adoption rates and lead to slower-than-expected revenue growth for companies in the camera component industry, especially Largan and Sunny Optical.

Largan Precision (3008 TT)

 Target price: **TWD4,200** (from TWD3,700)

 Share price (1 Aug): **TWD3,510** | Up/downside: **+19.6%**

 5 4 3 2 1
Buy
 (unchanged)

Capitalising on the multi-cam adoption trend

- ASP upside from rising dual-cam adoption in iPhones in 2017-18E
- Operating profit should grow by 18-44% YoY for 2H16-17
- Reiterating Buy (1) rating; raising TP to TWD4,200

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What's new: We continue to view Largan as a major beneficiary of the rising adoption of multi-cameras in smartphones. Despite the strong share-price rally of 80% YTD, we see upside on accelerated earnings growth in 2H16-17, driven by this industry trend. We would view any near-term pullback as an opportunity to accumulate. Buy (1) rating reiterated.

What's the impact: Dual-cam trend creates significant opportunities.

We expect the number smartphones with dual cameras to grow to 230m in 2017 and 390m in 2018, up from 60m units in 2016 and 10m in 2015, representing a CAGR of 156% over 2016-18, as discussed in the main section of this report. This trend should broaden the addressable market for high-end lens sets, and we believe Largan is well positioned to benefit given its leading industry position and solid customer profile.

In addition to the iPhone 7 Plus expected in September, which should be Apple's first dual-cam model (12MP+12MP), our market research indicates that Apple is planning to expand the adoption of dual-cams to all new models in 2H17. This should provide earnings-growth drivers for Largan on shipment and ASP upside, as it is a major supplier in the iPhone food chain.

Strong YoY operating profit growth near term; 2017-18 promising. As discussed in our note [Spec upgrade trend just beginning](#), we expect Largan's ASP to rise by 10-15% for the iPhone 7 (5P to 6P) and by 100% for the iPhone 7 Plus (dual-cam) over the current models. Due to its improving product mix, we forecast the gross margin to rise to 67.1% in 3Q16, from 55.1% in 3Q15, leading to operating profit of TWD8bn (+9% YoY), reversing the 19% YoY declines we saw in 1Q-2Q16. We expect revenue growth momentum to continue into 4Q16 and operating profit to grow by 18% YoY in 2H16. We raise our 2017-18E earnings by 13-18% to factor in an increasing adoption of dual-cams in smartphones. In total, we expect Largan to resume strong earnings growth of 46% YoY in 2017 and 23% YoY in 2018, from a 3% YoY decline in 2016.

What we recommend: We reaffirm our Buy (1) call and raise our 12-month TP to TWD4,200 (from TWD3,700), based on an unchanged PER of 18x, near the mid-point of the stock's past 5-year range of 8-24x, applied to our revised 1-year-forward EPS. Largan remains one of our top picks in the Greater China smartphone space (see "[Eyeing spec upgrade trends](#)", 10 May 2016). The key risk: weaker-than-expected dual-cam adoption.

How we differ: Our 2017-18E EPS are 14-17% above consensus, which we attribute to our positive view on dual-cam adoption in smartphones.

Forecast revisions (%)

Year to 31 Dec	16E	17E	18E
Revenue change	-	11.6	17.0
Net profit change	-	13.2	18.1
Core EPS (FD) change	-	13.2	18.1

Source: Daiwa forecasts

Share price performance



12-month range	1,830-3,515
Market cap (USDbn)	14.88
3m avg daily turnover (USDm)	72.50
Shares outstanding (m)	134
Major shareholder	Ch'en Shih Ch'ing (5.0%)

Financial summary (TWD)

Year to 31 Dec	16E	17E	18E
Revenue (m)	48,890	63,728	76,800
Operating profit (m)	28,053	40,467	49,805
Net profit (m)	23,504	34,244	42,194
Core EPS (fully-diluted)	175.218	255.283	314.549
EPS change (%)	(2.7)	45.7	23.2
Daiwa vs Cons. EPS (%)	3.1	13.5	17.4
PER (x)	20.0	13.7	11.2
Dividend yield (%)	1.8	1.7	2.5
DPS	63.0	61.3	89.3
PBR (x)	6.0	4.5	3.5
EV/EBITDA (x)	15.1	9.9	7.5
ROE (%)	33.1	37.4	35.3

Source: FactSet, Daiwa forecasts

Financial summary

Key assumptions

Year to 31 Dec	2011	2012	2013	2014	2015	2016E	2017E	2018E
Mobile phone lens shipment ('000 units)	286,554	344,730	539,156	869,054	998,771	892,579	1,057,559	1,222,772
Blended ASP of handset lens (USD)	1.33	1.34	1.35	1.47	1.47	1.56	1.85	1.95
Gross margin of VCM assembly (%)	6.8	5.3	6.0	7.4	8.4	7.5	7.5	7.5

Profit and loss (TWDm)

Year to 31 Dec	2011	2012	2013	2014	2015	2016E	2017E	2018E
Mobile Phone Lens Revenues	11,300	13,647	21,615	38,140	45,970	44,646	62,575	76,430
VCM Asembly Revenue	3,943	5,543	5,268	7,370	9,781	4,105	1,089	281
Other Revenue	742	882	550	301	118	140	64	88
Total Revenue	15,984	20,072	27,433	45,810	55,869	48,890	63,728	76,800
Other income	0	0	0	0	0	0	0	0
COGS	(9,043)	(11,710)	(14,472)	(21,291)	(23,812)	(16,192)	(17,844)	(21,005)
SG&A	(506)	(530)	(887)	(1,349)	(1,817)	(1,917)	(2,236)	(2,472)
Other op.expenses	(963)	(1,034)	(1,293)	(2,103)	(2,585)	(2,728)	(3,181)	(3,518)
Operating profit	5,472	6,798	10,781	21,067	27,655	28,053	40,467	49,805
Net-interest inc./(exp.)	50	84	122	250	349	455	464	697
Assoc/forex/extraord./others	314	(71)	598	1,646	1,156	155	426	457
Pre-tax profit	5,837	6,811	11,501	22,963	29,160	28,663	41,357	50,959
Tax	(638)	(1,234)	(1,891)	(3,525)	(5,003)	(5,159)	(7,113)	(8,765)
Min. int./pref. div./others	0	0	0	0	0	0	0	0
Net profit (reported)	5,199	5,578	9,610	19,438	24,157	23,504	34,244	42,194
Net profit (adjusted)	5,199	5,578	9,610	19,438	24,157	23,504	34,244	42,194
EPS (reported)(TWD)	38.755	41.581	71.640	144.909	180.084	175.218	255.283	314.549
EPS (adjusted)(TWD)	38.755	41.581	71.640	144.909	180.084	175.218	255.283	314.549
EPS (adjusted fully-diluted)(TWD)	38.755	41.581	71.640	144.909	180.084	175.218	255.283	314.549
DPS (TWD)	13.500	17.000	17.000	28.500	51.000	63.030	61.326	89.349
EBIT	5,472	6,798	10,781	21,067	27,655	28,053	40,467	49,805
EBITDA	6,372	8,005	12,229	22,728	29,495	28,053	40,467	49,805

Cash flow (TWDm)

Year to 31 Dec	2011	2012	2013	2014	2015	2016E	2017E	2018E
Profit before tax	5,837	6,811	11,501	22,963	29,160	28,663	41,357	50,959
Depreciation and amortisation	900	1,208	1,448	1,661	1,841	2,056	2,529	3,001
Tax paid	(638)	(1,234)	(1,891)	(3,525)	(5,003)	(5,159)	(7,113)	(8,765)
Change in working capital	1,202	(783)	(363)	(920)	7,411	(11,960)	(725)	(1,667)
Other operational CF items	18	(2)	51	(32)	6	(5)	(6)	(7)
Cash flow from operations	7,318	6,000	10,746	20,147	33,414	13,595	36,042	43,522
Capex	(3,149)	(2,865)	(1,504)	(5,568)	(8,213)	(4,500)	(4,500)	(4,000)
Net (acquisitions)/disposals	(2)	(101)	9	194	(0)	(10)	(10)	(10)
Other investing CF items	(23)	(19)	(1,593)	(695)	125	266	0	0
Cash flow from investing	(3,173)	(2,985)	(3,088)	(6,069)	(8,089)	(4,244)	(4,510)	(4,010)
Change in debt	319	(356)	12	108	(32)	(80)	0	0
Net share issues/(repurchases)	0	0	0	0	0	0	0	0
Dividends paid	(1,811)	(2,280)	(2,280)	(3,823)	(6,841)	(8,455)	(8,226)	(11,985)
Other financing CF items	37	(43)	51	138	(127)	0	0	0
Cash flow from financing	(1,456)	(2,679)	(2,217)	(3,577)	(7,000)	(8,535)	(8,226)	(11,985)
Forex effect/others	0	0	0	0	0	0	0	0
Change in cash	2,690	336	5,440	10,501	18,325	816	23,306	27,526
Free cash flow	4,169	3,136	9,242	14,579	25,201	9,095	31,542	39,522

Source: FactSet, Daiwa forecasts

Financial summary continued ...

Balance sheet (TWDm)

As at 31 Dec	2011	2012	2013	2014	2015	2016E	2017E	2018E
Cash & short-term investment	11,268	11,604	17,045	27,546	45,871	46,687	69,992	97,519
Inventory	1,461	2,532	2,693	3,538	3,730	2,612	2,878	3,388
Accounts receivable	3,510	6,581	6,823	13,338	11,537	12,725	16,587	19,989
Other current assets	234	255	248	388	363	349	455	549
Total current assets	16,473	20,973	26,809	44,809	61,500	62,373	89,912	121,444
Fixed assets	8,057	9,731	9,800	13,722	20,115	22,558	24,530	25,528
Goodwill & intangibles	0	0	0	0	0	0	0	0
Other non-current assets	379	485	2,004	2,523	2,372	2,121	2,137	2,154
Total assets	24,909	31,188	38,614	61,054	83,987	87,052	116,579	149,126
Short-term debt	444	93	83	190	157	100	100	100
Accounts payable	1,358	3,555	2,507	4,999	2,864	1,948	4,204	4,949
Other current liabilities	3,243	4,426	5,507	9,594	17,506	6,519	7,772	9,366
Total current liabilities	5,045	8,075	8,097	14,783	20,527	8,566	12,076	14,415
Long-term debt	0	0	0	0	0	0	0	0
Other non-current liabilities	54	49	71	72	73	50	50	50
Total liabilities	5,099	8,124	8,168	14,855	20,600	8,616	12,126	14,465
Share capital	1,341	1,341	1,341	1,341	1,341	1,341	1,341	1,341
Reserves/R.E./others	18,469	21,723	29,104	44,857	62,045	77,094	103,111	133,320
Shareholders' equity	19,810	23,064	30,445	46,198	63,386	78,435	104,453	134,661
Minority interests	0	0	0	0	0	0	0	0
Total equity & liabilities	24,909	31,188	38,614	61,054	83,987	87,052	116,579	149,126
EV	460,008	459,321	453,870	443,476	425,119	424,245	400,940	373,413
Net debt/(cash)	(10,824)	(11,511)	(16,962)	(27,356)	(45,713)	(46,587)	(69,892)	(97,419)
BVPS (TWD)	147.685	171.943	226.965	344.402	472.538	584.726	778.683	1,003.883

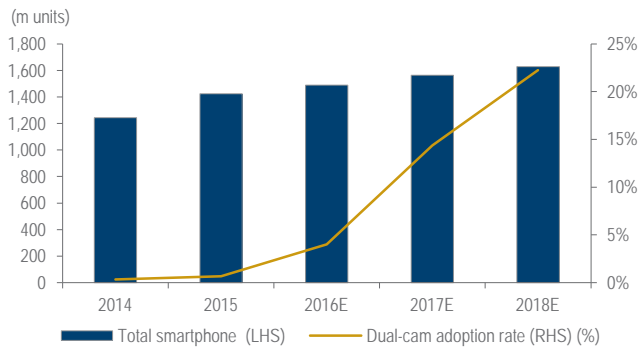
Key ratios (%)

Year to 31 Dec	2011	2012	2013	2014	2015	2016E	2017E	2018E
Sales (YoY)	29.4	25.6	36.7	67.0	22.0	(12.5)	30.3	20.5
EBITDA (YoY)	18.0	25.6	52.8	85.9	29.8	(4.9)	44.3	23.1
Operating profit (YoY)	17.4	24.2	58.6	95.4	31.3	1.4	44.3	23.1
Net profit (YoY)	28.5	7.3	72.3	102.3	24.3	(2.7)	45.7	23.2
Core EPS (fully-diluted) (YoY)	28.5	7.3	72.3	102.3	24.3	(2.7)	45.7	23.2
Gross-profit margin	43.4	41.7	47.2	53.5	57.4	66.9	72.0	72.7
EBITDA margin	39.9	39.9	44.6	49.6	52.8	57.4	63.5	64.9
Operating-profit margin	34.2	33.9	39.3	46.0	49.5	57.4	63.5	64.9
Net profit margin	32.5	27.8	35.0	42.4	43.2	48.1	53.7	54.9
ROAE	28.7	26.0	35.9	50.7	44.1	33.1	37.4	35.3
ROAA	23.7	19.9	27.5	39.0	33.3	27.5	33.6	31.8
ROCE	29.8	31.3	40.2	54.8	50.3	39.5	44.2	41.6
ROIC	57.7	54.2	72.0	110.3	125.5	92.9	100.9	114.9
Net debt to equity	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Effective tax rate	10.9	18.1	16.4	15.4	17.2	18.0	17.2	17.2
Accounts receivable (days)	76.4	91.7	89.2	80.3	81.3	90.6	83.9	86.9
Current ratio (x)	3.3	2.6	3.3	3.0	3.0	7.3	7.4	8.4
Net interest cover (x)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Net dividend payout	34.8	40.9	23.7	19.7	28.3	36.0	24.0	28.4
Free cash flow yield	0.9	0.7	2.0	3.1	5.4	1.9	6.7	8.4

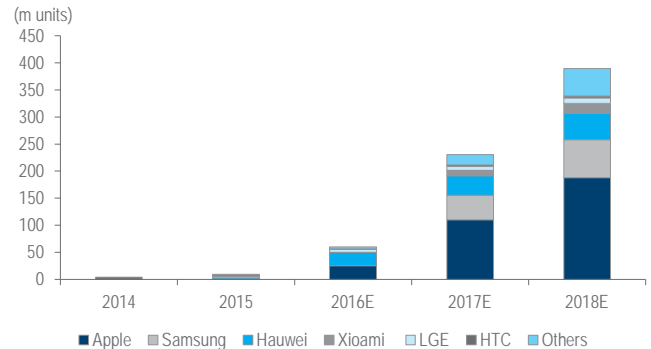
Source: FactSet, Daiwa forecasts

Company profile

In Asia ex-Japan, Largan Precision is the leading lens manufacturer for mobile handsets. Nokia, Motorola, Sony Ericsson, Apple, HTC, and BlackBerry are the company's major customers. It currently has about a 28% share of the global handset-lens market.

Largan: the dual-cam penetration in smartphone in 2014-18E


Source: Daiwa estimates and forecasts

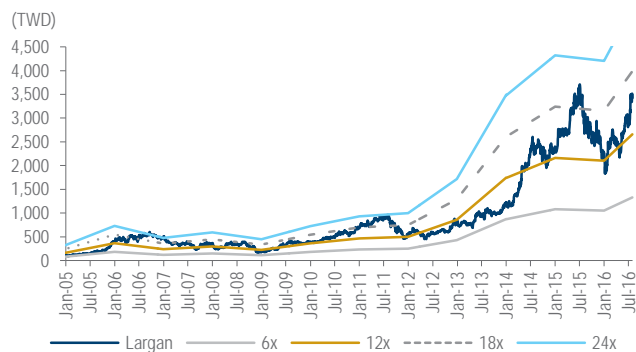
Largan: dual-cams adopted in smartphones by brand


Source: Daiwa estimates and forecasts

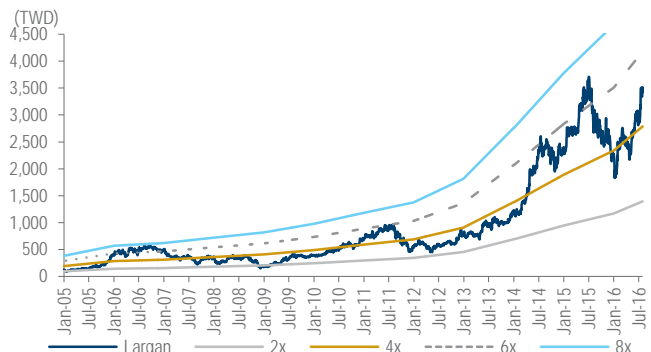
Largan: quarterly and annual P&L statements

(TWDm)	2016E				2017E				2016E	2017E	2018E
	1Q	2Q	3QE	4QE	1QE	2QE	3QE	4QE			
Net sales	8,271	10,044	14,021	16,554	10,997	14,294	17,539	20,897	48,890	63,728	76,800
COGS	3,335	3,378	4,613	4,867	3,409	3,717	5,069	5,649	16,192	17,844	21,005
Gross profit	4,936	6,666	9,408	11,687	7,588	10,578	12,470	15,248	32,698	45,884	55,795
Operating costs	751	876	1,361	1,657	948	1,192	1,506	1,771	4,645	5,417	5,990
Operating profit	4,185	5,790	8,047	10,031	6,640	9,386	10,964	13,477	28,053	40,467	49,805
Pretax profit	4,219	6,009	8,197	10,237	7,003	9,799	11,227	13,329	28,663	41,357	50,959
Net profit	3,623	3,690	6,968	9,223	6,022	7,447	9,655	11,119	23,504	34,244	42,194
Net EPS (TWD)	27	28	52	69	45	56	72	83	175	255	315
Operating Ratios											
Gross margin	59.7%	66.4%	67.1%	70.6%	69.0%	74.0%	71.1%	73.0%	66.9%	72.0%	72.7%
Operating margin	50.6%	57.6%	57.4%	60.6%	60.4%	65.7%	62.5%	64.5%	57.4%	63.5%	64.9%
Pre-tax margin	51.0%	59.8%	58.5%	61.8%	63.7%	68.5%	64.0%	63.8%	58.6%	64.9%	66.4%
Net margin	43.8%	36.7%	49.7%	55.7%	54.8%	52.1%	55.0%	53.2%	48.1%	53.7%	54.9%
YoY (%)											
Net revenue	-22%	-27%	-13%	7%	33%	42%	25%	26%	-12%	30%	21%
Gross profit	-18%	-16%	6%	26%	54%	59%	33%	30%	2%	40%	22%
Operating income	-19%	-19%	9%	26%	59%	62%	36%	34%	1%	44%	23%
Pretax income	-17%	-14%	-11%	30%	66%	63%	37%	30%	-2%	44%	23%
Net income	-18%	-24%	-15%	37%	66%	102%	39%	21%	-3%	46%	23%
QoQ (%)											
Net revenue	-46%	21%	40%	18%	-34%	30%	23%	19%			
Gross profit	-47%	35%	41%	24%	-35%	39%	18%	22%			
Operating income	-47%	38%	39%	25%	-34%	41%	17%	23%			
Pretax income	-47%	42%	36%	25%	-32%	40%	15%	19%			
Net income	-46%	21%	40%	18%	-34%	30%	23%	19%			

Source: Company, Daiwa forecasts

Largan: 1-year forward PER


Source: Company, Daiwa forecasts

Largan: 1-year forward PBR


Source: Company, Daiwa forecasts

Sunny Optical Technology (2382 HK)

 Target price: **HKD34.00** (from HKD29.00)

 Share price (1 Aug): **HKD30.90** | Up/downside: **+10.0%**

 5 4 3 **2** 1

Outperform
 (unchanged)

Rosy earnings outlook on favourable industry trends

- HCM and HLS ASP benefiting from use of dual-cams in smartphones
- Expect earnings to grow by 28-44% YoY in 2016-18E with rising ROE
- Reiterating Outperform (2); raising TP to HKD34

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What's new: We view Sunny Optical (Sunny) as a major beneficiary of the rising trend of multi-camera adoption in smartphones. Although the shares have rallied by 80% YTD, we see further upside given its solid earnings growth for 2016-17E. We would see any near-term pull-back on profit-taking as a good opportunity to accumulate the stock.

What's the impact: **Dual-cam trend brings lots of opportunity.** We expect the number of smartphones with dual-cams to grow to 230m/390m for 2017/18, respectively, from 60m units in 2016E, and 10m in 2015, as discussed in the main section of this report. We think Sunny, a major supplier in handset camera modules (HCM) and handset lens sets (HLS), should be well positioned to benefit from this trend.

In addition to Hauwei, our industry research suggests that more dual-cam models from the tier-1 China brands, including Xiaomi, LeTV, Oppo, Vivo, etc, would arrive in 2H16-1H17. Owing to Sunny's improved product mix and the rise in dual-cam adoption, we expect the ASP for its HCM to grow by 4-12% YoY for 2016-18E, from a decline of 3% YoY in 2015. In terms of HLS, our research suggests that Samsung Electronics (SEC) is likely to adopt dual-cams for its flagship model to be launched in 1H17. We expect Sunny, a major lens supplier to Samsung, to enjoy spill-over benefits from an increase in overall HLS demand, although the Korean vendors should remain the major supply source for this model. As a result, we forecast Sunny's HLS shipments to grow by 21-27% for 2016-18E.

Strong earnings growth on favourable trends. We think Sunny is set to bear the fruit of emerging opportunities on the back of its comprehensive product offering. In addition to benefits offered from the multi-cam handset trend, its vehicle business is also embracing multi-cam opportunities on the back of the rising adoption of advanced driver assistance systems (ADAS) in smart cars. In total, we forecast Sunny's earnings to grow by 28-44% YoY for 2016-18E with ROE rising to 29% for 2018E, from 21% in 2015.

What we recommend: We raise our 2017-18E earnings by 9-14% to factor in the increase in smartphone dual-cam adoption that we expect. We reaffirm our Outperform (2) rating and lift our 12-month TP to HKD34 (from HKD29), based on 22x PER (previous: 21x), which is the high point of its past-3-year trading range of 9-22x, on our revised 1-year-forward EPS, to factor in the better earnings growth outlook. Sunny remains our top pick in the Greater China smartphone space (see "[Eyeing spec upgrade trends](#)"). The key risk: weaker-than-expected dual-cam adoption rate.

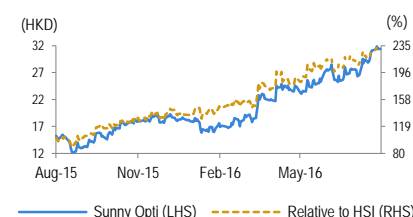
How we differ: Our 2017-18E EPS are 10-14% above consensus due to our more optimistic revenue assumption.

Forecast revisions (%)

Year to 31 Dec	16E	17E	18E
Revenue change	-	6.1	10.4
Net profit change	-	8.9	13.9
Core EPS (FD) change	-	8.9	13.9

Source: Daiwa forecasts

Share price performance



12-month range	12.08-31.40
Market cap (USDbn)	4.27
3m avg daily turnover (USDm)	19.06
Shares outstanding (m)	1,074
Major shareholder	Sun Xu Ltd (38.4%)

Financial summary (CNY)

Year to 31 Dec	16E	17E	18E
Revenue (m)	13,120	16,520	19,430
Operating profit (m)	1,215	1,672	2,166
Net profit (m)	1,096	1,487	1,910
Core EPS (fully-diluted)	1.020	1.384	1.777
EPS change (%)	43.9	35.7	28.4
Daiwa vs Cons. EPS (%)	3.6	10.0	13.9
PER (x)	25.9	19.1	14.9
Dividend yield (%)	0.8	1.2	1.6
DPS	0.208	0.306	0.415
PBR (x)	6.0	4.8	3.9
EV/EBITDA (x)	17.8	12.8	9.6
ROE (%)	25.6	28.1	28.9

Source: FactSet, Daiwa forecasts

Financial summary

Key assumptions

Year to 31 Dec	2011	2012	2013	2014	2015	2016E	2017E	2018E
Handset CCM shipment (m units)	70	97	133	187	228	264	303	335
Blended ASP of handset CCM (USD)	2.38	3.78	4.98	5.68	5.51	5.75	6.45	6.82
Vehicle lens shipment (m units)	0	0	8	11	17	23	33	46
Handset lens shipment (m units)	32	36	26	75	302	376	476	574

Profit and loss (CNYm)

Year to 31 Dec	2011	2012	2013	2014	2015	2016E	2017E	2018E
Handset CCM Revenues	1,069	2,307	4,157	6,576	7,785	9,404	12,093	14,158
Vehicle Lens Revenues	100	167	291	421	651	945	1,393	2,019
Other Revenue	1,329	1,510	1,365	1,429	2,260	2,771	3,034	3,252
Total Revenue	2,499	3,984	5,813	8,426	10,696	13,120	16,520	19,430
Other income	0	0	0	0	0	0	0	0
COGS	(1,976)	(3,243)	(4,846)	(7,137)	(8,933)	(10,840)	(13,576)	(15,806)
SG&A	(182)	(214)	(254)	(482)	(597)	(745)	(860)	(985)
Other op.expenditures	(131)	(163)	(251)	(231)	(257)	(320)	(412)	(472)
Operating profit	210	363	462	577	909	1,215	1,672	2,166
Net-interest inc./(exp.)	(3)	(3)	(7)	(14)	(16)	(21)	(22)	(22)
Assoc/forex/extraord./others	33	37	49	71	(31)	65	65	65
Pre-tax profit	240	397	504	634	862	1,259	1,715	2,210
Tax	(38)	(58)	(64)	(73)	(99)	(161)	(226)	(298)
Min. int./pref. div./others	14	7	(0)	5	(2)	(2)	(2)	(2)
Net profit (reported)	215	346	440	566	762	1,096	1,487	1,910
Net profit (adjusted)	215	346	440	566	762	1,096	1,487	1,910
EPS (reported)(CNY)	0.223	0.360	0.443	0.529	0.709	1.020	1.384	1.777
EPS (adjusted)(CNY)	0.223	0.360	0.443	0.529	0.709	1.020	1.384	1.777
EPS (adjusted fully-diluted)(CNY)	0.223	0.360	0.443	0.529	0.709	1.020	1.384	1.777
DPS (CNY)	0.044	0.071	0.102	0.112	0.154	0.208	0.306	0.415
EBIT	210	363	462	577	909	1,215	1,672	2,166
EBITDA	298	472	609	792	1,155	1,527	2,072	2,620

Cash flow (CNYm)

Year to 31 Dec	2011	2012	2013	2014	2015	2016E	2017E	2018E
Profit before tax	240	397	504	634	862	1,259	1,715	2,210
Depreciation and amortisation	88	109	147	215	246	312	400	454
Tax paid	(38)	(58)	(64)	(73)	(99)	(161)	(226)	(298)
Change in working capital	(264)	(169)	55	(898)	609	(650)	(423)	(381)
Other operational CF items	14	7	(0)	5	(2)	(2)	(2)	(2)
Cash flow from operations	40	286	643	(117)	1,616	758	1,463	1,982
Capex	(112)	(265)	(286)	(465)	(351)	(650)	(400)	(400)
Net (acquisitions)/disposals	1	13	1	(62)	(64)	0	0	0
Other investing CF items	0	(38)	(26)	(178)	(60)	60	0	0
Cash flow from investing	(111)	(291)	(311)	(705)	(475)	(590)	(400)	(400)
Change in debt	(35)	34	392	56	167	(5)	0	0
Net share issues/(repurchases)	0	0	0	0	0	0	0	0
Dividends paid	(43)	(69)	(101)	(120)	(166)	(223)	(329)	(446)
Other financing CF items	(20)	(27)	589	(55)	(2)	0	0	0
Cash flow from financing	(97)	(61)	879	(120)	(0)	(229)	(329)	(446)
Forex effect/others	0	0	0	0	0	0	0	0
Change in cash	(169)	(66)	1,211	(942)	1,141	(60)	735	1,136
Free cash flow	(73)	20	357	(582)	1,265	108	1,063	1,582

Source: FactSet, Daiwa forecasts

Financial summary continued ...

Balance sheet (CNYm)

As at 31 Dec	2011	2012	2013	2014	2015	2016E	2017E	2018E
Cash & short-term investment	681	614	1,826	884	2,025	1,964	2,699	3,835
Inventory	472	748	768	896	897	1,141	1,429	1,664
Accounts receivable	627	901	1,172	2,388	3,003	3,415	4,300	5,057
Other current assets	42	4	1	36	93	52	66	78
Total current assets	1,822	2,267	3,766	4,204	6,017	6,573	8,494	10,634
Fixed assets	489	646	785	1,035	1,141	1,479	1,479	1,425
Goodwill & intangibles	0	0	0	0	0	0	0	0
Other non-current assets	64	89	114	354	478	418	418	418
Total assets	2,375	3,002	4,665	5,594	7,636	8,470	10,391	12,477
Short-term debt	62	103	489	522	683	684	684	684
Accounts payable	599	939	1,257	1,744	2,914	2,970	3,719	4,330
Other current liabilities	9	11	36	31	142	52	66	78
Total current liabilities	671	1,052	1,782	2,297	3,739	3,706	4,470	5,092
Long-term debt	17	0	18	36	33	36	36	36
Other non-current liabilities	7	18	6	11	19	10	10	10
Total liabilities	694	1,070	1,805	2,343	3,791	3,752	4,516	5,138
Share capital	98	98	105	105	105	105	105	105
Reserves/R.E./others	1,584	1,834	2,755	3,145	3,740	4,612	5,770	7,234
Shareholders' equity	1,681	1,932	2,860	3,251	3,845	4,717	5,875	7,339
Minority interests	0	0	0	0	0	0	0	0
Total equity & liabilities	2,375	3,002	4,665	5,594	7,636	8,470	10,391	12,477
EV	27,799	27,888	27,081	28,073	27,091	27,156	26,421	25,285
Net debt/(cash)	(601)	(512)	(1,319)	(327)	(1,309)	(1,244)	(1,979)	(3,115)
BVPS (CNY)	1.741	2.007	2.876	3.038	3.579	4.391	5.469	6.831

Key ratios (%)

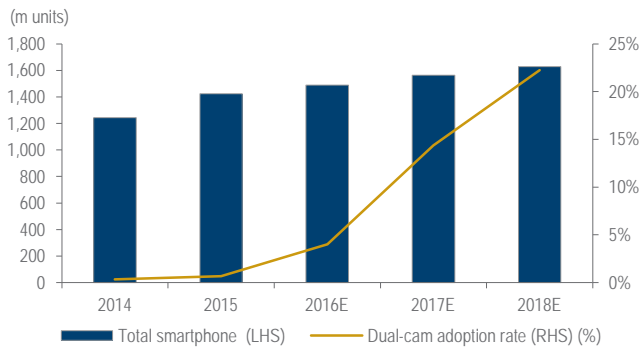
Year to 31 Dec	2011	2012	2013	2014	2015	2016E	2017E	2018E
Sales (YoY)	37.4	59.5	45.9	45.0	26.9	22.7	25.9	17.6
EBITDA (YoY)	30.3	58.1	29.1	30.0	45.9	32.2	35.7	26.5
Operating profit (YoY)	48.0	73.0	27.1	24.9	57.6	33.6	37.6	29.6
Net profit (YoY)	49.7	60.8	27.2	28.5	34.5	43.9	35.7	28.4
Core EPS (fully-diluted) (YoY)	51.7	61.3	23.1	19.4	34.0	43.9	35.7	28.4
Gross-profit margin	20.9	18.6	16.6	15.3	16.5	17.4	17.8	18.7
EBITDA margin	11.9	11.8	10.5	9.4	10.8	11.6	12.5	13.5
Operating-profit margin	8.4	9.1	7.9	6.8	8.5	9.3	10.1	11.2
Net profit margin	8.6	8.7	7.6	6.7	7.1	8.4	9.0	9.8
ROAE	13.4	19.2	18.4	18.5	21.5	25.6	28.1	28.9
ROAA	9.7	12.9	11.5	11.0	11.5	13.6	15.8	16.7
ROCE	12.3	19.1	17.1	16.1	21.7	24.3	27.8	29.6
ROIC	18.9	24.8	27.3	22.9	29.5	35.3	39.4	46.2
Net debt to equity	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Effective tax rate	15.8	14.7	12.6	11.5	11.5	12.8	13.2	13.5
Accounts receivable (days)	79.0	70.0	65.1	77.1	92.0	89.3	85.2	87.9
Current ratio (x)	2.7	2.2	2.1	1.8	1.6	1.8	1.9	2.1
Net interest cover (x)	70.4	115.7	70.0	41.3	56.8	58.3	77.4	100.3
Net dividend payout	19.8	19.8	22.9	21.3	21.8	20.4	22.1	23.4
Free cash flow yield	n.a.	0.1	1.3	n.a.	4.5	0.4	3.7	5.6

Source: FactSet, Daiwa forecasts

Company profile

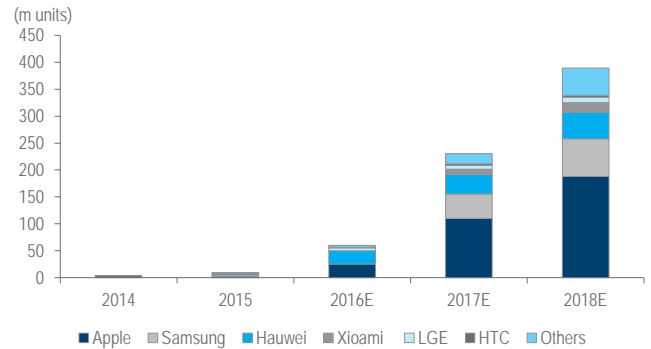
Founded in 1984, Sunny Optical is the leading optical component manufacturer in the China technology supply chain. It develops and provides optical-related products with various applications, including instruments, components and opto-electronic modules. The company's major customers include leading China smartphone brand name makers Huawei, Lenovo and OPPO.

Sunny: dual-cam penetration in smartphones in 2014-18E



Source: Daiwa estimates and forecasts

Sunny: dual-cams adopted in smartphones by brand



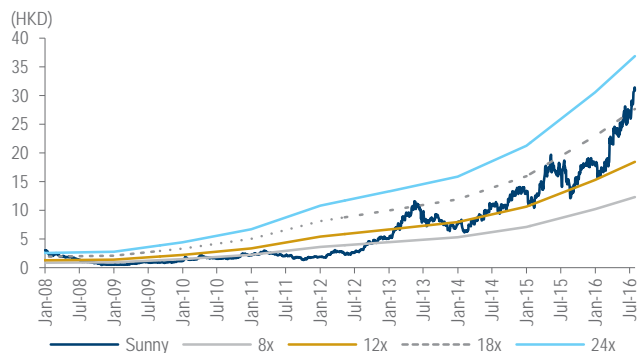
Source: Daiwa estimates and forecasts

Sunny: semi-annual and annual P&L statement

(CNYm)	2016E		2017E		2016E	2017E	2018E
	1H	2HE	1HE	2HE			
Net sales	5,329	7,791	7,163	9,357	13,120	16,520	19,430
COGS	4,433	6,406	5,899	7,677	10,840	13,576	15,806
Gross profit	895	1,385	1,264	1,680	2,280	2,944	3,624
Operating costs	442	623	572	700	1,065	1,272	1,457
Operating profit	453	762	691	980	1,215	1,672	2,166
Pre-tax income	468	789	721	992	1,257	1,713	2,208
Net income	407	689	628	859	1,096	1,487	1,910
Net EPS (CNY)	0.38	0.64	0.58	0.80	1.02	1.38	1.78
Operating ratios							
Gross margin	16.8%	17.8%	17.6%	18.0%	17.4%	17.8%	18.7%
Operating margin	8.5%	9.8%	9.7%	10.5%	9.3%	10.1%	11.2%
Pre-tax margin	8.8%	10.1%	10.1%	10.6%	9.6%	10.4%	11.4%
Net margin	7.6%	8.8%	8.8%	9.2%	8.4%	9.0%	9.8%
YoY (%)							
Net revenue	15%	29%	34%	20%	23%	26%	18%
Gross profit	24%	33%	41%	21%	29%	29%	23%
Operating income	40%	30%	53%	29%	34%	38%	30%
Pre-tax income	34%	54%	54%	26%	46%	36%	29%
Net income	32%	52%	54%	25%	44%	36%	28%
HoH (%)							
Net revenue	-12%	46%	-8%	31%			
Gross profit	-14%	55%	-9%	33%			
Operating income	-23%	68%	-9%	42%			
Pre-tax income	-9%	69%	-9%	37%			
Net income	-10%	69%	-9%	37%			

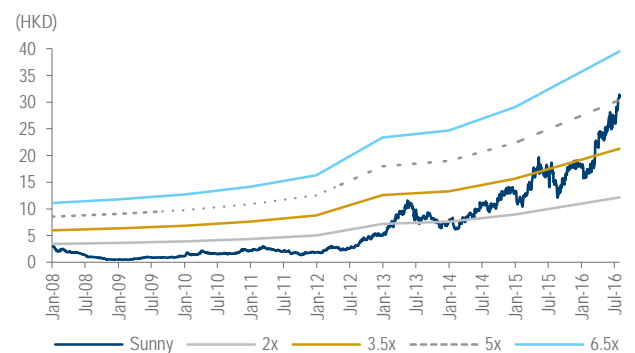
Source: Daiwa forecasts

Sunny Optical: 1-year-forward PER



Source: Bloomberg, Daiwa forecasts

Sunny Optical: 1-year-forward PBR



Source: Bloomberg, Daiwa forecasts

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