

# IMX188PQ

## Diagonal 2.16 mm (Type 1/8.3) Back-illuminated Color CMOS Image Sensor for HD 720p Video Featuring High Picture Quality, Compact Size and Low Power Consumption



The development of Internet phone services and a well-developed communication infrastructure has increased the opportunities for video communication using personal computers, tablets, smartphones and TVs. This has naturally led to a demand for high-picture quality still images and high-resolution video.

The new 1M-pixel CMOS image sensor developed by Sony for smartphones uses an "Exmor R" back-illuminated structure with 1.4  $\mu\text{m}$  unit pixel that delivers HD video shooting capability of 720p at 60 frame/s.

The circuit structure and drive method have been optimized for video shooting giving the new chip a more compact size and lower power consumption than our existing products.

- Diagonal 2.16 mm (Type 1/8.3)  
approx. 1.07M-effective pixels
- High S/N ratio (+4 dB over  
existing Sony products)
- Pixel size: 1.4  $\mu\text{m}$  unit pixel
- HD 720p at 60 frame/s
- High CRA (30°) compliant
- Low power consumption (35%  
lower than existing Sony products)

### Exmor R™

\* "Exmor R" is a trademark of Sony Corporation. The "Exmor R" is a Sony's CMOS image sensor with significantly enhanced imaging characteristics including sensitivity and low noise by changing fundamental structure of "Exmor" pixel adopted column-parallel A/D converter to back-illuminated type.

Communications involving a camera is the latest trend in phone communications over the Internet and makes it easy for anyone to contact anybody anywhere at any time.

Our goal was to satisfy the need for cameras that are so good that "it is as if the person you are talking to is right in front of you" and that are capable of reproducing images of high-quality color and texture. To do this, Sony chose the 1.4  $\mu\text{m}$  unit pixel back-illuminated CMOS image sensor, whose specifications are highly regarded, for use in the video communications market where HD video is rapidly becoming the norm.

#### High Picture Quality through High Sensitivity and High Frame Rate

So far Sony has manufactured the IMX119PQ, a front-illuminated structure chip, for smartphone, personal computer and other applications. However to satisfy greater customer demand for a higher quality picture, Sony started using back-illuminated CMOS image sensors, which are more efficient in converting incident light into electrons. Compared to our existing products, the new product has a signal-to-noise ratio that is 4 dB better giving it the industry's highest picture quality. (See photograph 1.)

Sony's proprietary high-speed column-parallel A/D conversion circuit and the MIPI interface, a high-speed serial interface standard for cellular phones made it possible to produce HD 720p video at a maximum output of 60 frame/s.

The result is crisper, smooth HD video with low screen distortion and less grain.

#### Compact Size and High CRA Increase Product Appeal

As thin laptop computers, smartphones and smart TV sets indicate, there is an unrelenting demand not only for better picture quality but also for more compact and thin products that allow greater flexibility for creative design.

The optimized circuit structure and revision of the layout design of the IMX188PQ have reduced the chip size by about 20% over existing products and made it a compact 3.285 mm (H)  $\times$  2.549 mm (V). (See photograph 2.)

Optimization of the light-collecting characteristics has expanded CRA characteristics to 30° without impairing color mixture

characteristics and enabled thinner products. All of these efforts have shrunk the module to a height of less than 2.5 mm. These improvements have helped making already slim laptop PCs, smartphones and other devices even thinner while increasing screen size and reducing the bezel area.

#### Low Power Consumption First Step towards a Possible New Product Category

Long battery life is an important element in a mobile device. Control that efficiently switches the column-parallel A/D conversion circuit and analog circuits of the IMX188PQ to low-power consumption mode by the block has made it possible to cut power consumption by roughly 35% compared to existing Sony products. (See figure 1.)

Long continuous HD video recording capability and availability of compact batteries and other solutions will allow us to respond to the need for integration of cameras in products that so far could not contain them.

#### V O I C E

The project members worked on this development with the "HD for everyone" motto in our minds.

Although the image sensor is very small, it will play a large role in connecting people. Compact size and low power consumption will make it possible to integrate it in products that so far could not contain a camera.

These cameras will enable their owners to create images that will deliver happiness, inspiration and joy. It is definitely a product worth considering.

**Photograph 1** Sample Image (HD 720p, 30 frame/s, Analog Gain: 0 dB, 900 lx)

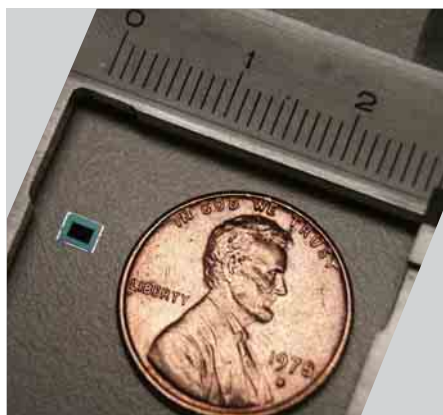


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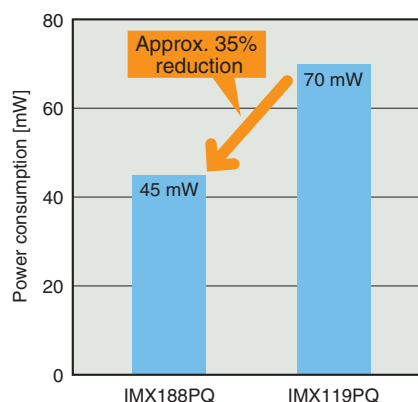


IMX119PQ (existing product)

**Photograph 2** Device Size



**Figure 1** Reduction in Power Consumption (HD 720p, 30 frame/s Typ.)



**Table 1** Device Structure

tem		IMX188PQ	IMX119PQ (existing product)
Image size		Diagonal 2.16 mm (Type 1/8.3)	Diagonal 2.3 mm (Type 1/7.8)
Total number of pixels		1328H × 864V Approx. 1.15M pixels	1304H × 1080V Approx. 1.41M pixels
Number of effective pixels		1328H × 832V Approx. 1.10M pixels	1304H × 1048V Approx. 1.37M pixels
Device Size		3.285 mm (H) × 2.549 mm (V)	3.4 mm (H) × 2.96 mm (V)
Fabrication process		Back-illuminated process	Front-illuminated process
Unit cell size		1.4 μm (H) × 1.4 μm (V)	←
Output format		RAW10, RAW8	←
Output interface		MIPI 1 lane	←
Control signal interface		I <sup>2</sup> C	←
Power supply specifications	Analog	2.7 +0.2/-0.1 V	←
	Digital	1.2 ± 0.1 V	←
	I/O	1.8 ± 0.1 V	←
Moving picture specifications		720p 60 frame/s	←
Power consumption (HD 720p 30 frame/s)		45 mW (Typ.)	70 mW (Typ.)
CRA		30°	25°