

2M-Pixel CMOS Camera Module with Autofocus Function for Mobile Equipment

MCB770

Based on Sony's experience introducing 1.3M-pixel CCD camera modules to the marketplace, Sony has embarked on efforts to respond to customer desires for increased pixel counts, improved functionality, reduced power consumption, and further miniaturization and lower mounting heights in CCD camera modules.

The MCB770 introduced here is a new product that responds to these desires with newly-developed technologies such as a 2M-pixel CMOS sensor and an AF function that can handle a wide range of camera to subject distances.

This product adopts many ideas from the dedicated digital still camera, which has acquired wide support in the image creation areas, to achieve a balanced and rich set of image expression capabilities.

- 3-element, 3-group glass lens with AF function
- CMOS sensor with 2.01M camera block effective pixels
- Supports both uncompressed moving picture and JPEG compressed still image data formats
- Image expression capabilities based on the AE and AWB technologies used in dedicated digital still cameras

■ High-Performance Lens with Wide Distance Range AF Function

The MCB770 includes an AF system for the first time in a Sony camera module product. This AF system focuses over a wide range of distances from 10 cm, a distance selected specifically for imaging QR codes, to infinity. It also includes a focus point prediction function to improve focusing performance. In addition to an AF control system that takes advantage of Sony's experience in dedicated digital still cameras, it also adopts a linear method.

This made it possible to create a miniature low-power AF system optimal for a camera module. The MCB770 also supports manual focus.

Sony achieved low TV distortion and high resolution performance by combining a lens design optimized in conjunction with the sensor structure with a 3-element, 3-group glass lens.

■ High Picture Quality CMOS Sensor for Mobile Equipment

The MCB770 includes the IMX011CQ* diagonal 5.97 mm (Type 1/3.0) 2.13M total pixels primary color progressive scan CMOS sensor that was designed at the same time as the MCB770. This device was designed for use in mobile equipment and achieves the high-speed progressive scan of all pixels at 15 frames/s and the same high picture quality as CCD sensors. While it goes without saying that this device uses Sony's know-how developed over many years of CCD development as a foundation, this device also features further optimization of the pixel layout and on-chip microlenses.

* IMX011CQ: See CX-NEWS Vol. 40.

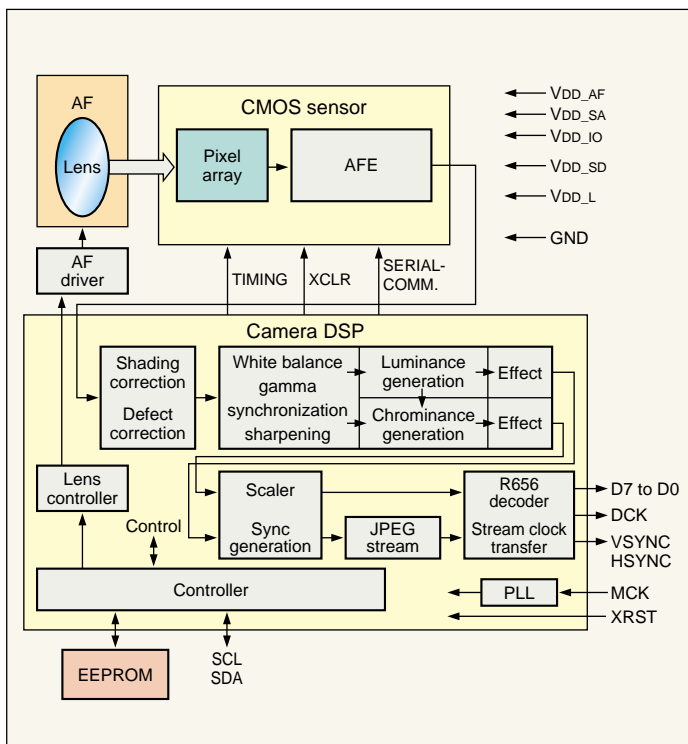
■ Newly-Developed DSP for Natural Image Rendition and High-Generality Interface

The MCB770 provides three formats: draft mode, which is intended for preview moving picture, uncompressed capture mode for moving picture recording, and JPEG capture mode for still images. The MCB770 supports flexible end product design by providing a variety of image sizes in each of these modes.

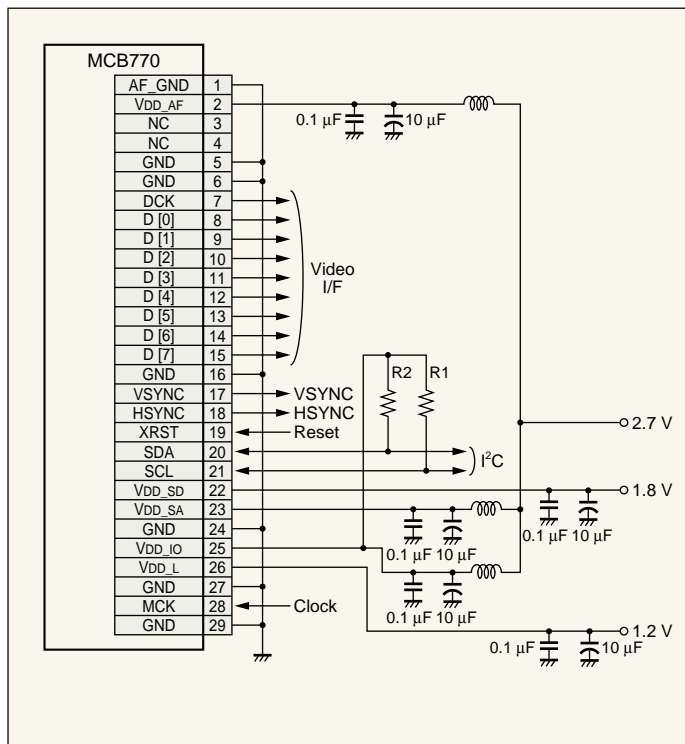
The MCB770 provides rich image expression that will not betray our customers' hopes for image creation. The AE and AWB algorithms implemented in the newly-developed DSP are based on concepts from dedicated digital still cameras and take into account the functional balance required in a camera module. The MCB770 thus provides imaging performance in difficult conditions that is equivalent to that of dedicated digital still cameras. Furthermore, the MCB770 provides a scene selection function that can set optimal condition for the camera module simply by selecting a scene mode that matches the scene being imaged.

V O I C E

This newly-developed camera module was made possible by the persistence of each of the persons in charge of the various components; the lens, sensor, DSP, mechanism, mounting, image quality, and plant. Our idea was to provide more freedom and more fun to users, we wanted our users to experience the pleasure of being able to photograph the things around them freely and easily. We are committed to continuing to develop products to the best of our ability.



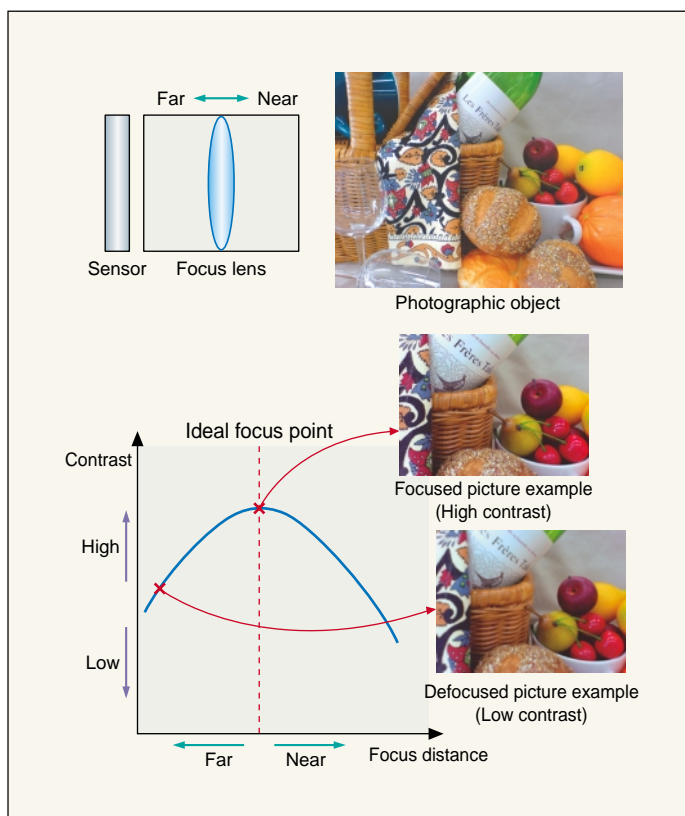
■ Figure 1 Block Diagram



■ Figure 2 Application Circuit Example

■ Table 1 Specification Overview

Functions	2M-pixel CMOS camera module with AF function for mobile equipment	
Image sensor	Progressive scan readout diagonal 5.97 mm (Type 1/3.0) color CMOS sensor	
Number of pixels	Total number of pixels	2.13M pixels
	Camera block number of effective pixels	2.01M pixels
Lens	Recording block number of effective pixels	1632 (H) × 1224 (V) (2M pixels)
	Horizontal angle of view	About 52°
Exposure control	F value	2.8
	Focal length	4.8 mm
	Subject distance	100 mm to ∞, AF function provided
White balance control	Auto (normal and long time exposure modes), hold	
Scene selection	Auto tracking, all pull-in, user setting	
Data formats	A total of six types	
	Uncompressed moving picture, JPEG compressed still images	
Video signals	Frame rates	Draft mode: 30 or 15 fps (up to CIF) Uncompressed capture mode: 15 fps (up to VGA) Capture mode: 15 fps (128 × 96 to 2M)
	Uncompressed moving picture, JPEG compressed still images	YCbCr 8 bits Stream data, no headers
Control signals	I ² C bus	
Input clock frequency	12.0/13.0/14.4/18.0/19.2/24.0/26.0 MHz	
Supply voltage	• 2.7 ± 0.1 V (V _{DD_AF} : AF system)	
	• 2.6 to 2.9 V (V _{DD_SA} : Sensor analog system)	
	• 2.3 to 3.0 V (V _{DD_IO} : DSP I/O)	
	• 1.8 ± 0.1 V (V _{DD_SD} : Sensor digital system)	
	• 1.2 ± 0.1 V (V _{DD_L} : DSP core)	
Power consumption	170 mW, AF system not operating	
Temperature conditions	Operating temperature	Absolute maximum rating: -10 to +60°C Recommend operating range: -5 to +45°C
	Storage temperature	-30 to +80°C
Package dimensions	17.4 mm × 14.5 mm × 10.5 mm (H × W × D)	
Mass	5 g	



■ Figure 3 AF System Operation