

**Quadrant 1/3 - Inch 2-Megapixel  
SOC Sensor Module  
QM20MMS-4T28CPT30**

**Preliminary Datasheet**

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### 1. Features

- DigitalClarity™ CMOS Imaging Technology System-On-Chip (SOC)—Completely integrated camera system Ultra-low power, lowcost, progressive scan CMOS image sensor Superior low-light performance On-chip image flow processor (IFP) performs sophisticated processing:
  - Color recovery and correction
  - Sharpening, gamma, lens-shading correction
  - On-the-fly defect correction
  - Filtered image downscaling to arbitrary size with smooth, continuous zoom and pan
  - Automatic Features:
    - Auto exposure (AE)
    - Auto white balance (AWB)
    - Auto black reference (ABR)
    - Auto flicker avoidance
    - Auto color saturation
    - Auto defect identification and correction
  - Fully auto matic Xenon and LED-type flash support
  - Fast exposure adaptation
  - Multiple parameter contexts
  - Easy / fast mode switching
  - Camera control sequencer automates
  - Snapshots
  - Snapshots with flash Video clips
  - Simple two-wire serial programming interface
  - ITU-R BT.656 ( YCbCr ) , 565RGB, 555RGB or 444RGB formats (progressive scan)
  - Raw and processed Bayer formats
  - Output FIFO and integer clock divider: “Uniform” pixel clocking

**Table 1: Key Performance Parameters**

PARAMETER		TYPICAL VALUE
Optical Format		1/3.2-inch (4:3)
Active Imager Size		4.73mm (H) x 3.52mm (V) 5.9mm Diagonal
Active Pixels		1,600H x 1,200V
Pixel Size		2.8µm x 2.8µm
Color Filter Array		RGB Bayer Pattern
Shutter Type		Shutter (ERS) Electronic Rolling
Max. Data Rate/Max. Master Clock		80 MB/s/6MHz to 80 MHz
Frame Rate	UXGA (1600x1200)	15f ps
	QUXGA (800x600)	30f ps
ADC Resolution		10 bit, dual on-chip
Responsivity		1.0 V/lux-sec (550nm)
Dynamic Range		71dB
SNR <sub>MAX</sub>		42.3dB
Supply Voltage	I/O Digital	1.7V–3.1V
	Core Digital	1.7V–1.95V
	Analog	2.5V–3.1V
Power Consumption		348mW UXGA at 15 fps (full resolution)
		223mW QUXGA at 30 fps (preview mode )
Operating Temperature		-30°C to +70°C
Packaging		28-pin PLCC 6.2mm Height

### 2. Applications:

- Cellular phones
- PDAs
- Toys
- Other battery-powered products

### 3. General Description

The Quadrant Imaging QM20MMS-4TS28CPT30 is an SXGA-format single-chip camera with a one-third-inch CMOS active-pixel digital image sensor. This device combines the QM13MMS image sensor core with fourth-generation digital-image-flow processor technology from Imaging. It captures high quality color images at SXGA resolution.

This megapixel CMOS image sensor features DigitalClarity—a Quadrant breakthrough—low-noise CMOS imaging technology. This technology achieves CCD image quality (based on signal-to-noise ratio and lowlight sensitivity) while maintaining the inherent size, cost, and integration advantages of CMOS.

The sensor is a complete camera-on-a-chip solution designed specifically to meet the low-power, lowcost demands of battery-powered products such as cellular phones, PDA s, and toys. It incorporates sophisticated camera functions on-chip and is programmable through a simple two-wire serial interface.

The QM20MMS-4TS28CPT30 performs sophisticated processing functions including color recovery, color correction, sharpening, programmable gamma correction, auto black reference claming, auto exposure (AE), automatic 50Hz/60Hz flicker avoidance, lens-shading correction, auto white balance (AWB), and on-the-fly defect identification and correction.

#### Additional features

include day/night mode configurions; special camera effects such as sepia tone and solarization; and interpolation to arbitrary image size with continuous filtered zoom and pan. The device supports both Xenon and LED-type flash light sources in several snapshot modes.

The QM20MMS-4TS28CPT30 can be programmed to output progressive-scan images up to 30 frames per second (fps); in preview power-saving mode, and 15fps in full-resolution (SXGA) mode. In either mode, the image data can be output in any one of six 8-bit formats:

ITU-R BT.656 (formerly CCIR 656, progressive scan only) YCbCr

565RGB

555RGB

444RGB

Raw Bayer

“Processed” Bayer

The FRAME\_VALID and LINE\_VALID signals are output on dedicated pins, along with a pixel clock that is synchronous with valid data.

### 4. Feature Overview

The Quadrant is a fully-automatic, single-chip camera, requiring only a power supply, lens and clock source for basic operation. Output video is streamed via a parallel eight-bit DOUT port as shown in Figure 1 on page 6. The output pixel clock is used to latch data, while FRAME\_VALID and LINE\_VALID signals indicate the active video. The QM20MMS-4TS28CPT30 internal registers are configured using a two-wire serial interface.

The device can be put in a low-power sleep mode by asserting the standby pin and shutting down the clock. Output pads can be tri-stated by de-asserting the OE# pin. Both tri-stating output pins and entry into standby mode can also be achieved via two-wire serial interface register writes.

The QM20MMS-4TS28CPT30 accepts input clocks up to 54MHz, delivering up to 15fps for UXGA resolution images, and up to 30fps for QUXGA (full field-of-view, sensor pixel skipping) images. The device also includes a lowpower preview configuration that delivers UXGA images at 7.5fps, and QUXGA images at 30fps. The device can be programmed to slow the frame rate in low-light conditions to achieve longer exposures and better image quality. Standard FRAME\_VALID / LINE\_VALID video.

#### Internal Architecture

Internally, consists of a sensor core and an image-flow processor (IFP). The IFP is divided into two sections: the colorpipe (CP), and the camera controller (CC). The sensor core captures raw Bayer-encoded images that are then input in to the IFP. The CP section of the IFP processes the incoming stream to create interpolated, color-corrected output, and the CC section controls the sensor core to maintain the desired exposure and color balance, and to support snapshot modes. The sensor core, CP, and CC registers are grouped into three separate address spaces as shown in Figure 2. When accessing internal registers via the two-wire serial interface, select the desired address space by programming the R240 shared register.

The QM20MMS-4T28CPT30 accelerates mode-switching with hardware-assisted context switching, and supports taking snapshots, flash snapshots, and video clips using a configurable sequencer.

The QM20MMS-4T28CPT30 supports a range of color formats derived from four primary color representations:

YCbCr, RGB, raw Bayer (unprocessed, directly from the sensor) and processed Bayer ( Bayer-format data regenerated from processed RGB). The device also supports a variety of output signaling/ timing options :

Standard FRAME\_VALID / LINE\_VALID video interface with gated pixel clocks

Standard video interface with uniform clocking ITU-R BT.656 marker-embedded video interface with either gated or uniform pixel clocking.

### Register Notation

The following register address notations are used in this document:

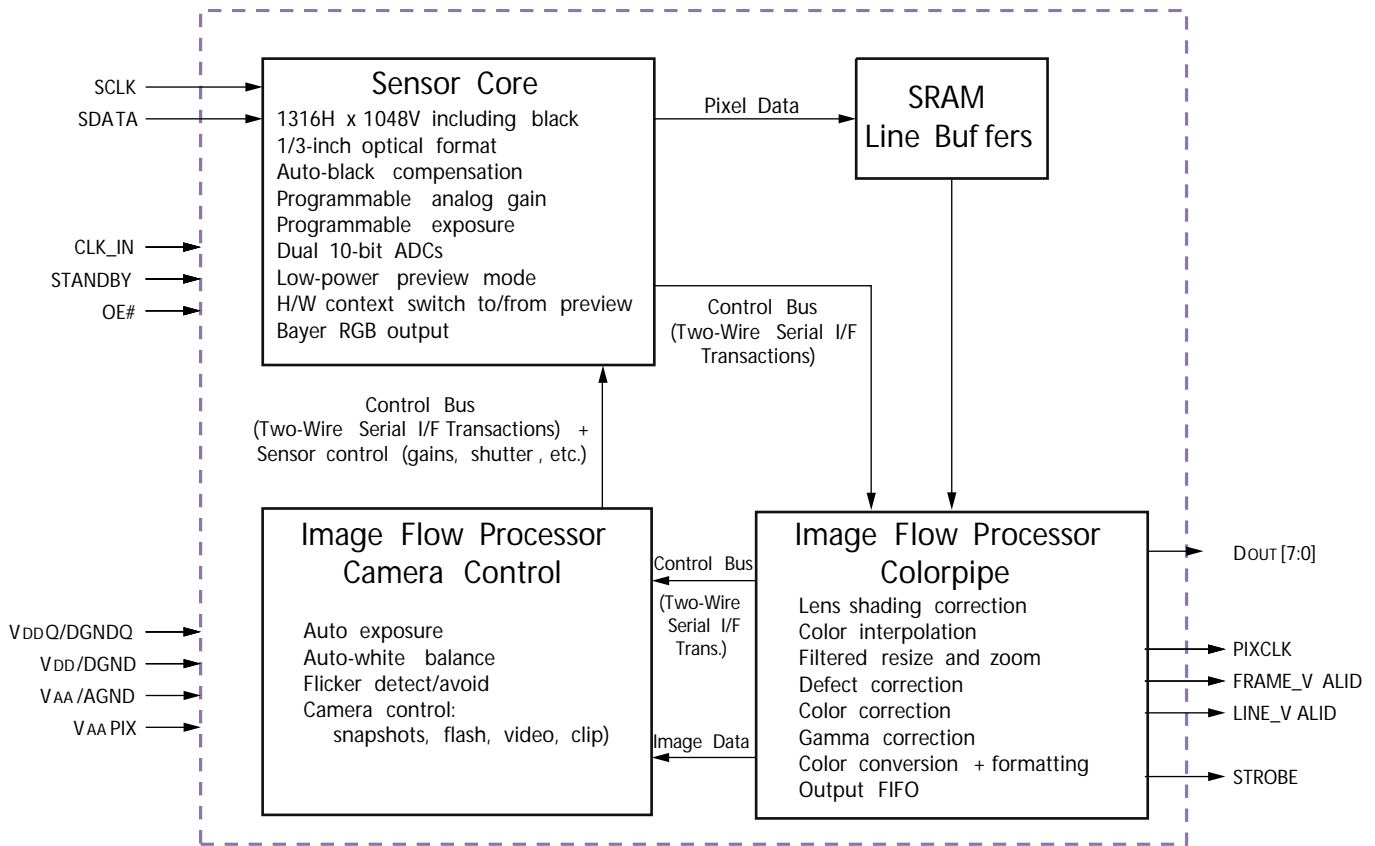
R<decimal address>:<address page>

Example: R9:0—Shutter width register in sensor page (page 0). Used to uniquely specify a register.

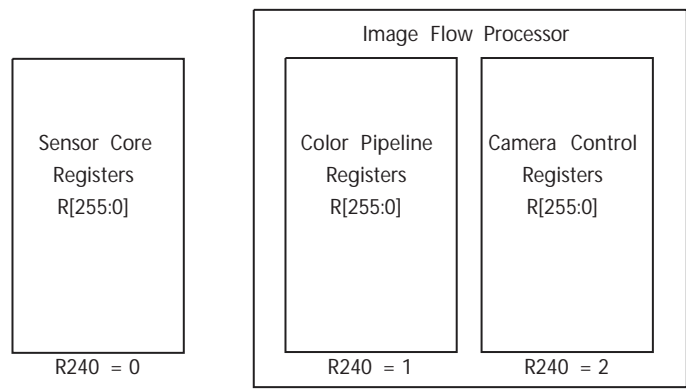
R <decimal address>

Example: R240—Page address register. Used when the register address is the same in all three pages or when by context the address page is understood.

**Figure 1: Functional Block Diagram**

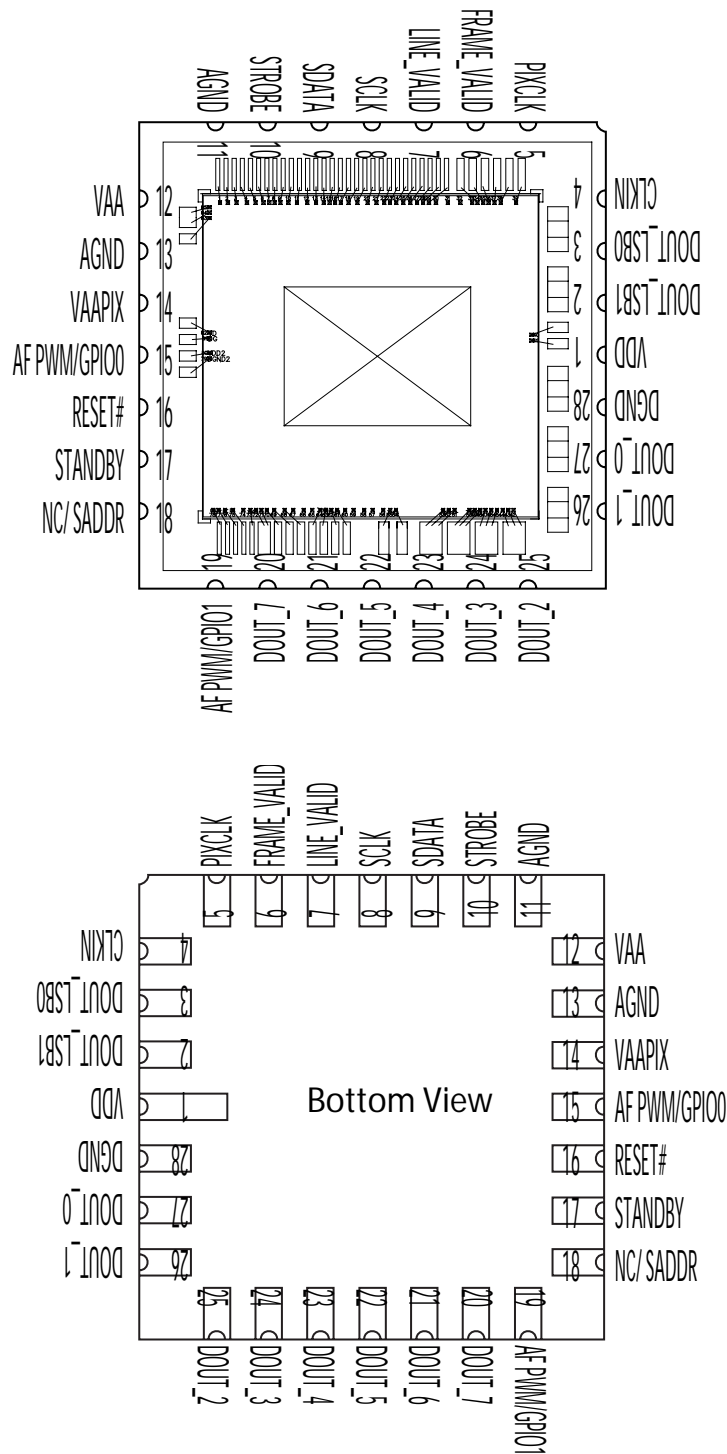


**Figure 2: Internal Registers Grouping**



**NOTE:**  
 Internal registers are grouped in three address spaces. Program R240 to select the desired address space.

**Figure 3. Pin Configuration**



Note: SADDR is bonding option, if need ir ask wire bonding option.

The pin # 18 can be SADDR

for Auto Focus:

1. 1^2C mode: using pin # 2 & 3.
2. PWM mode: using pin # 15 & 19.

Figure 4. 28 Pin package dimension

