

SiS1-t285EM



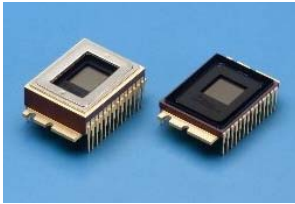
SINGLE PHOTON SENSITIVE 14-BIT, 1 MEGAPIXEL CCD-CAMERA SYSTEM WITH ON CHIP ELECTRON MULTIPLYING TECHNOLOGY



The Scientific Imaging System SIS1-t285EM (EMCCD) is a supersensitive, high-resolution 14-bit camera system designed for all kinds of industrial and scientific LLL (Low Level Light) applications. Up to now conventional image-intensified CCD-camera systems had to be used for such applications. By application of *On Chip Charge Gain* CCD image sensors a readout noise of $<0.5e^-$ is achieved so that the sensitivity of the system is increased up to the range of single-photon-detection. This is also achieved by the high quantum efficiency in the near UV-range up to the IR-range and the low dark current of the Texas Instruments image sensor TC285SPD. The resulting high sensitivity, the square pixel with a size of $8\mu\text{m} \times 8\mu\text{m}$ and the high image resolution of 1 megapixel is optimally qualified for all applications in the optical microscopy, in particular for low fluorescence and luminescence.

Features	
0.5e⁻ rms Noise ▶	The <i>On Chip Charge Gain</i> technology (EM) intensifies the image electrons before the CCD-readout step by the factor >100 which results in a readout noise of $<0.5e^-$.
High Resolution ▶	1 Megapixel 2/3" frame transfer image sensor Texas Instruments TC285SPD with 1004 x 1002 square pixel with size of $8\mu\text{m} \times 8\mu\text{m}$.
14-bit Digitalization ▶	Intensity resolution of 16,384 grayscales, 64 times better than 8-bit systems, important for photometric measurements and structures with low contrast.
Low Dark Current ▶	The low dark current of $<4e^-/\text{pixel}/\text{s}$ offers the possibility of long time integration for μ -Lux imaging.
65% Quantum Efficiency ▶	The high quantum efficiency of 65% @ 610nm and the SNR of $<0.5e^-$ rms offer a high sensitivity for imaging at low light levels.
Anti-Blooming Function ▶	Blooming from one overexposed pixel to adjacent pixels will be avoided by an efficiency of an overexposure factor of >1000 relative to the full well capacity.
External Timing ▶	Asynchronous electronic integration time control by external gate input for integration times from 200 μs up to hours.
10Hz Frame Rate ▶	The frame rate of 10Hz at full image resolution provides the possibility of image sequences with high time resolution and a live-mode for optimal setting possibilities.
Binning + Partial Scan ▶	The addition of electronic charges of lines and columns (Binning) of the image sensor increases the sensitivity and the frame rate. The partial scan provides frame rates up to the kHz-range.
WinSIS-Software ▶	WinSIS6 for WinXP/2000/NT/9x controls all camera functions and integration timing. The concept of intuitive easy-to-use operation for all imaging and processing functions with integrated job creation and macro definition offers a fast realization of complex applications without long training periods. SDK for personal programming

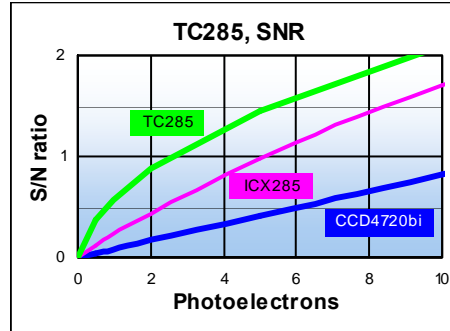
SiS1-t285EM



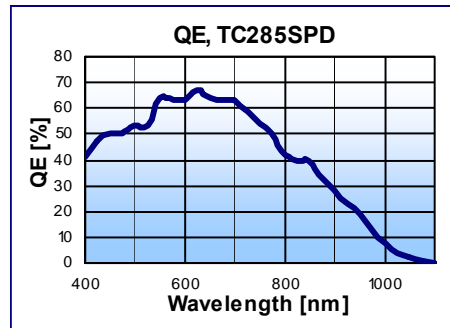
Monochrome, progressive-scan 2/3"-CCD image sensor Texas Instruments TC285SPD, with and without integrated peltier cooling device.

Specifications

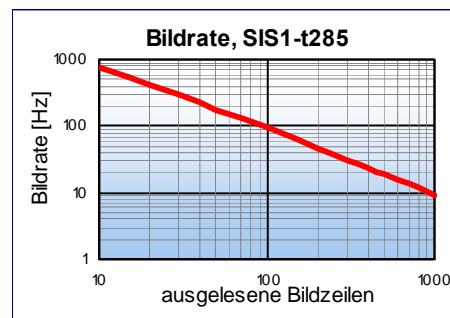
CCD Image Sensor	Texas Instruments, TC285SPD
Sensor Type	Progressive Scan, Frametransfer
Sensor Format	4 : 3; 2/3"-image sensor
Image Size	8.032mm x 8.016mm, 11.35mm diagonal
Pixel Size	8µm x 8µm
Pixel Number	1004 (H) x 1002 (V)
Electron Capacity	40,000e ⁻
Noise, rms	<20e ⁻ , no Gain. <0.5e ⁻ , emGain=100.
Dynamic	1,760 : 1; Gain=1
Dark Current @ 15° C	< 4e ⁻ / Pixel / s
Quantum Efficiency	63% @550nm -700nm
Anti-Blooming	1000 x e ⁻ capacity
Binning	2 - 255 vertical, 2 horizontal
Partial Scan	Vertical, user-defined
Digitalization	14-bit
Frame Rate	9.4Hz
Integration Time	100µs to >1h
Trigger	External, asynchronous
Gain	1 - 100, em on chip
Optical Mount	c-mount
Mech. Dim. (BxHxL)	100mm x 85mm x 165mm
Weight	800g
Operational Temperature	+5 ... +45°C



At low level lighting the Signal to Noise Ratio SNR is determined by the readout noise and by the quantum efficiency (TC285: 0.5e⁻, QE > 63%) of the CCD image sensor. For comparison the chart shows the performance of the backilluminated frame transfer sensor CCD4720bi (blue, QE >90%) and the inline transfer sensor ICX285 (purple).



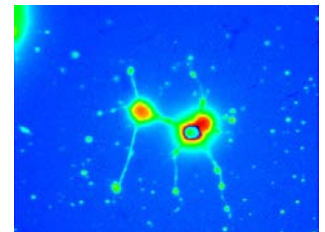
The quantum efficiency QE is defined as the percentage of the incoming photons, which generate an electronic charge.



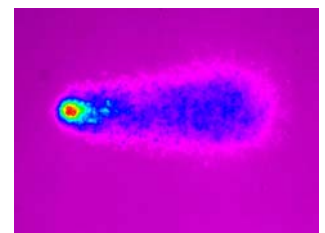
The readout of partial images (ROIs) and the binning of lines increase the frame rate up to the kHz-range because only a small number of image sensor lines have to be transferred. There can be up to four user-defined line-ROI's.

Applications

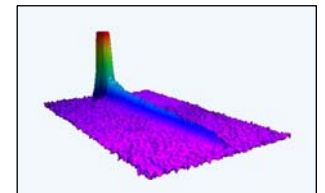
- ▶ LowLightLevel Imaging
- ▶ Fluorescence
- ▶ Luminescence
- ▶ Chemiluminescence
- ▶ Comet Assay
- ▶ FISH
- ▶ Spectroscopy
- ▶ Electrophoresis
- ▶ Gel-applications
- ▶ Astronomy
- ▶ Combustion processes
- ▶ Quality control
- ▶ Process control
- ▶ BEC



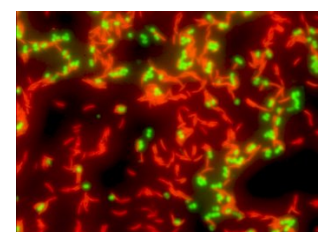
FURA, calciumfluorescence of a cancer cell



DAPI, Comet Assay



Absorption, atom laser beam



FISH Megapec

THETA SYSTEM Elektronik GmbH

Rathausstraße 13
D-82194 Gröbenzell
Tel +49 (0)8142-4678 0
Fax +49 (0)8142-4678 90
info@theta-system.de
www.theta-system.de