PHOTOMETRICS®

a division of Roper Scientific, Inc.

# Cascade:650

653 x 492 imaging array | 7.4 x 7.4-µm pixels

The Cascade:650 digital imaging system from Photometrics® offers very high sensitivity through the use of *on-chip multiplication gain*. The CCD camera's 16-bit digitization at 10 MHz provides good dynamic range at video frame rates and higher, while the fine pitch of the detector's pixels, 7.4 x 7.4 microns, is ideally matched to the resolution of optical microscopes. The thermoelectrically cooled system represents an excellent solution for low-light-level applications such as single-molecule fluorescence (SMF), intracellular ion imaging, and biological fluid flow measurements.

Features	Benefits
On-chip multiplication gain	Very high sensitivity Low-noise, impact-ionization process
653 x 492 imaging array 7.4 x 7.4-µm pixels	Resolves fine detail Ideally matched to optical microscope
10-MHz readout 5-MHz readout	Good for high-speed image visualization Perfect for high-precision photometry
16-bit digitization	Wide dynamic range allows detection of bright and dim signals in the same image
Frame-transfer CCD	100% duty cycle to collect continuous data No mechanical shutter required
Virtual-phase CCD	Offers higher sensitivity compared to typical front-illuminated CCD cameras
Thermoelectric cooling	Reduces background for high sensitivity
C-mount	Easily attaches to microscopes, standard lenses, or optical equipment
Acquisition software	Captures, analyzes, and saves high-resolution images
PCI interface	High-bandwidth, uninterrupted data transfer

PVCAM®
  Circular buffers
  Device sequencing
	Supported by numerous third-party software packages
	  Real-time focus
	  Precise integration with shutters, filter wheels, etc.
	
	Compatible with Windows® 2000/XP, Mac OS X, and Red Hat® Linux® 9.0 (kernel version 2.4)

Cascade®
Photometrics
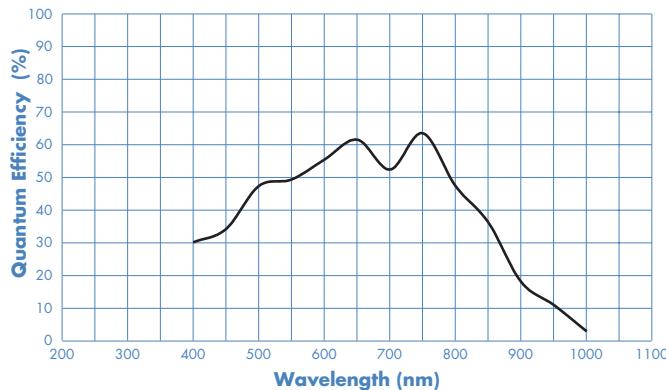
Note: Typical QE for a virtual-phase CCD is shown.

Region	Frames per second
653 x 492	27
256 x 256	51
128 x 128	100
64 x 64	188
32 x 32	338
16 x 16	555

Note: Frame rates are measured at 10 MHz with 0-second exposure times.

Specifications

CCD image sensor	Texas Instruments TC253; front-illuminated, frame-transfer CCD with on-chip multiplication gain
CCD format	653 x 492 imaging pixels; 7.4 x 7.4-µm pixels; 4.9 x 3.7-mm imaging area (optically centered)
Linear full well single pixel	27,000 e-
Digitizer type	16 bits @ 10 MHz and 5 MHz
On-chip multiplication gain	Software selectable; minimum achievable gain: 200x
Read noise	25 e- rms @ 10 MHz and 5 MHz (without on-chip multiplication gain enabled) *Read noise effectively reduced to <1 e- rms with on-chip multiplication gain enabled*
Frame readout	36.2 ms/frame; 210 µs (image-to-storage shift time)
CCD temperature	-25 to -35˚C (regulated)
Dark current	1 e-/p/s @ -35˚C
Binning	Full binning capabilities in parallel direction; no hardware binning in serial direction
Operating environment	0 to 30˚C ambient, 0 to 80% relative humidity noncondensing
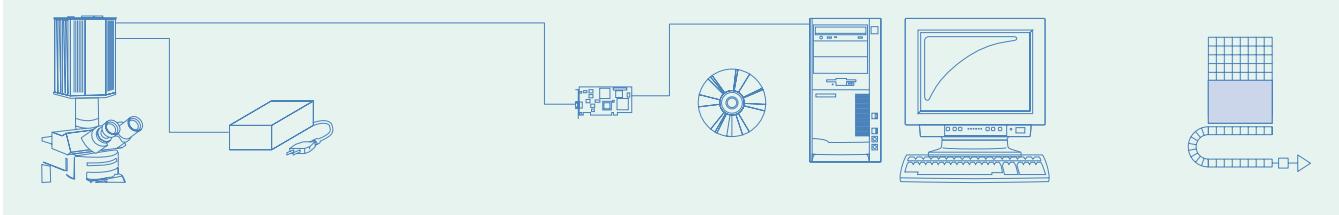
Note: Specifications are subject to change.