# QIMAGING®

**DIGITAL IMAGING MADE EASY**

# ROLERA™ *thunder*

QImaging presents the **Rolera Thunder**: the most quantitative and sensitive camera ever offered on the QImaging product line. The Thunder contains a 16um pixel, 512x512 EMCCD sensor with >90% QE and read noise <1e-.

Combined with a linear EM gain and onboard EM calibration, the Rolera Thunder offers the ideal imaging solution for low light applications.
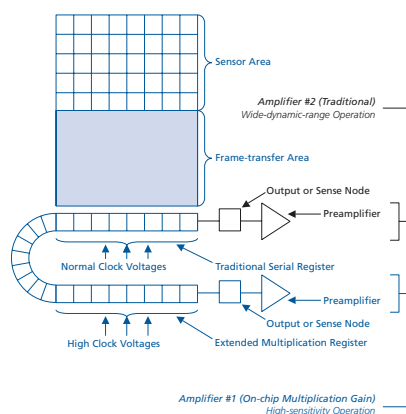
## camera models

*Includes: IEEE-1394 FireWire cable, IEEE-1394 PCIe card, power supply, and access to SDK*

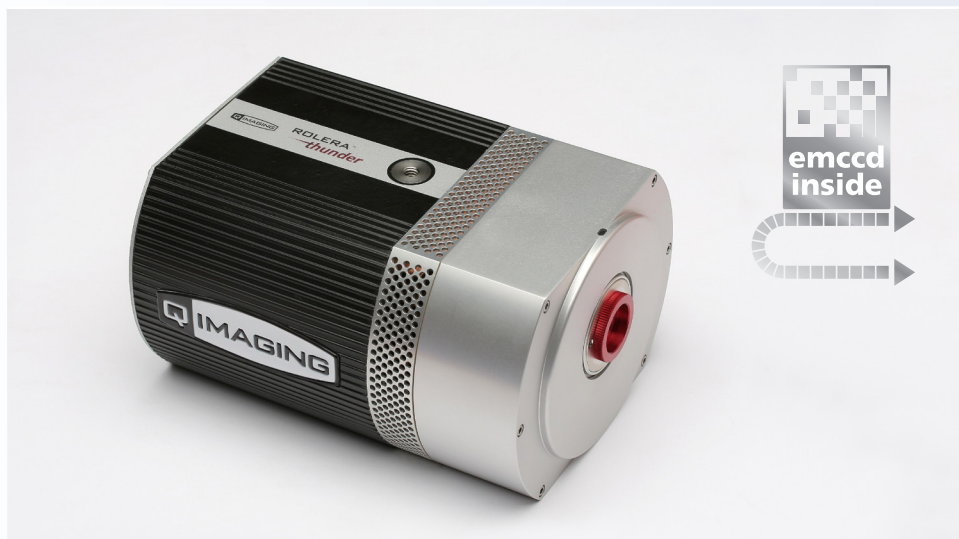- **Monochrome Rolera Thunder**
  Model: 01-ROL-THUNDER-F-M-16-C

## camera options

- Extended Warranty

## emccd architecture

Sensor Area
Amplifier #2 (Traditional)
*Wide-dynamic-range Operation*
Frame-transfer Area
Output or Sense Node
Preamplifier
Normal Clock Voltages
Traditional Serial Register
Preamplifier
Output or Sense Node
High Clock Voltages
Extended Multiplication Register
Amplifier #1 (On-chip Multiplication Gain)
*High-sensitivity Operation*

# High-Speed, Extremely Sensitive Digital EMCCD Camera

emccd inside

| features | benefits |
|---|---|
| High Quantum Efficiency | ■ Extremely high sensitivity for demanding low-light & fluorescence imaging; up to 90%+ between 500–650nm |
| High-Speed Readout | ■ Previewing & focusing in real time<br>■ 385+fps with 6x6 binning and ROI<br>■ 30fps full resolution @ 16 bits<br>■ Ideal for automated imaging applications |
| Low-Noise Electronics | ■ Quantitation & imaging of low light levels |
| Flexible Exposure Control | ■ Optimal integration over a wide range of light levels |
| External Sync & Trigger | ■ Tight synchronization with flashlamps, automated filters, shutters, & microscope stages |
| Three-Stage Peltier Cooling | ■ Reduces thermal noise for low-light long exposures while providing temperature stability |
| Binning | ■ Increases sensitivity for quantitation & imaging of very low light levels<br>■ Increases frame rate |
| IEEE-1394 FireWire Connection | ■ Simple connectivity<br>■ Better noise performance<br>■ Ease of use & installation<br>■ Portability with laptop computer<br>■ Simultaneous use of multiple cameras through a single port |
| PVCam®<br>    Circular buffers<br>    Device sequencing | ■ Supported by numerous third-party software packages<br>    ■ Real-time focus<br>    ■ Precise integration with shutters, filter wheels, etc. |

# ROLERA THUNDER Specifications

## emccd sensor

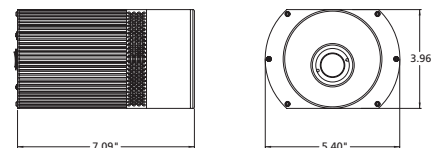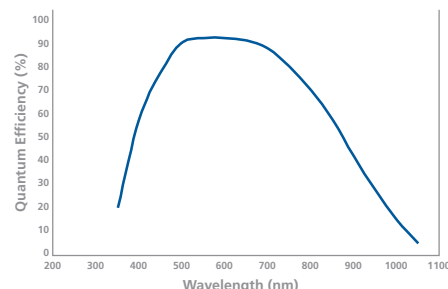| | | |
|---|---|---|
| Light-Sensitive Pixels | 512 x 512 | |
| Binning Modes | 1, 2, 3, 4, 5, 6 horizontally, arbitrary vertically | |
| ROI (Region of Interest) | From 1x1 pixels up to full resolution, continuously variable in single-pixel increments | |
| Sensor Type | e2v L3Vision CCD97, back-illuminated device | |
| Pixel Size | 16µm x 16µm | |
| Linear Full Well | 800,000e- (EM mode); 200,000e- (conventional) | |
| Read Noise | "EM gain" amplifier | "Traditional" amplifier |
| | 40 e- rms @ 5MHz<br>55 e- rms @ 10MHz<br>*Read noise effectively reduced to <1 e- rms with EM gain enabled* | <8 e- rms @ 1.25MHz<br>15 e- rms @ 5MHz |
| Dark Current | 0.5 e-/pix/s | |
| Cooling Technology | Three-stage Peltier cooling, chamber back-filled with nitrogen at atmosphere, assembled in a cleanroom environment | |
| Cooling Type | Down to -25°C, regulated, with software control in 1°C increments | |
| Digital Output | 16 bits | |
| Readout Frequency | 10, 5MHz (EM mode);  5, 1.25MHz (normal mode) | |
| Frame Rate | 30fps full resolution @ 16 bits (385+ maximum with binning and ROI functions) | |

## camera

| | |
|---|---|
| Computer Platforms/ Operating Systems* | Windows® XP, Vista, or Windows 7<br>Mac OS X |
| Digital Interface | IEEE-1394 FireWire |
| External Trigger | TTL Input |
| Trigger Types | Internal, Software, External |
| External Sync | TTL Output |
| EM Gain Control | 1 to 1000 times (typical)<br>Self calibrating linearization |
| Optical Interface | 2/3", C-mount optical format |
| Threadmount | 1/4" – 20 mount |
| Weight | 3.18kg (7lbs) |
| Warranty | 2 years |
| Operating Environment | 0 to 30°C, 0 to 80% relative humidity non-condensing |
| Storage Temperature | -20 to 60°C |

## applications

- **Spinning-Disk Confocal Microscopy**
- **Dynamic Ratio Imaging (e.g., pH, Low-Concentration Flux)**
- **FRAP (Fluorescence Recovery After Photobleaching)**
- **Live-Cell Fluorescent Protein Imaging**
- **Astronomy**
- **Bose-Einstein Condensate**

## spectral response