# Imaging·Illumination·Spectroscopy·Microscopy

## Components and Tools 2011 Catalog

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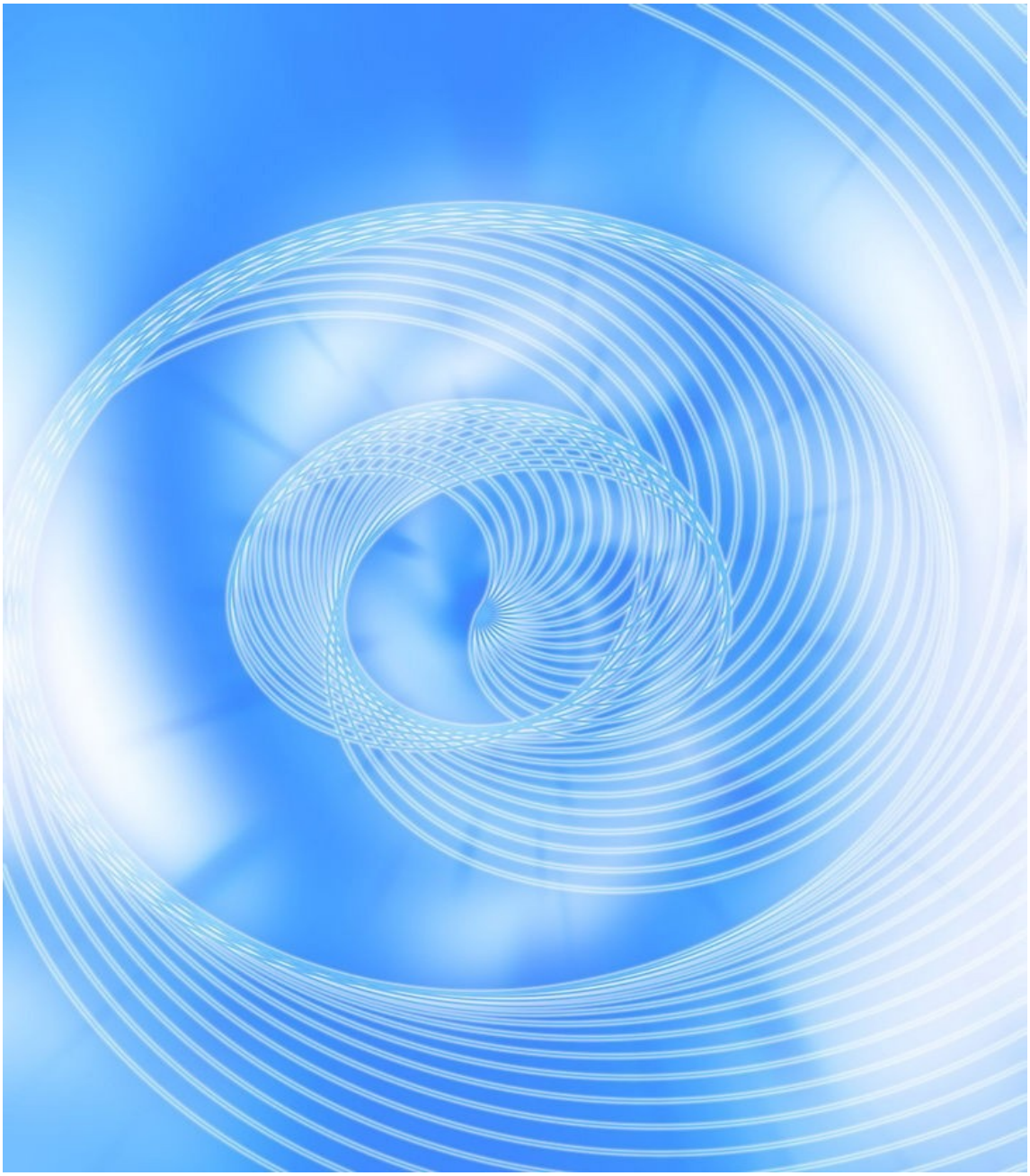

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Mightex USB 2.0 cameras are designed for a wide variety of applications (such as industrial inspections, digital microscopy and medical imaging), which require good quality cameras that are easy to use and cost-effective. Monochrome cameras often exhibit 20% higher spatial resolution than their color counterparts because no pixel interpolation is necessary. Without a Bayer color filter on the sensor, monochrome cameras are also more sensitive than color sensors especially in near IR and UV regions. Frame rate can be as high as 22 fps at full resolution and up to 600 fps using ROI mode. In addition, a user-friendly GUI based application software and an SDK are provided for custom software development. The cameras have 4-pin GPIOs and optional built-in LED drivers. A DirectShow driver and a TWAIN driver are also provided to easily link the cameras with users' applications.

### PERFORMANCE SPECIFICATIONS

| Parameters | MCN-B013-U | GLN-B013-U | MCE-B013-U | MLE-B013-U | Unit |
|---|---|---|---|---|---|
| Board-level/enclosed | Board-level | Board-level | Enclosed | Enclosed | |
| Number of GPIOs | 4 | 4 | 4 | No | |
| Built-in LED Drivers | No | Yes | No | Yes | |
| Resolution | 1280x1024 monochrome | | | | |
| CMOS Chip | ½" (5:4) Aptina MT9M001, Rolling Shutter | | | | |
| Pixel Size | 5.2 x 5.2 | | | | µm |
| Active Imager Size | 6.66 x 5.32 | | | | mm |
| Scanning System | Progressive | | | | |
| Dynamic Range | 68 | | | | dB |
| Sensor SNR | 45 | | | | dB |
| Gray Level | 8 | | | | bit |
| Responsivity | 2.1 | | | | V/lux -sec |
| Frame Rates (@48MHz Clock) | 22 @1280x1024, 32 @1024x768, 50 @800x600, 70 @640x480<br>180 @320x240, 300 @160x120, 450 @64x64, 600 @32x32 | | | | fps |
| Sub Resolutions | 1024x768, 800x600, 640x480, 320x240, 160x120, 64x64, 32x32 | | | | |
| Shutter Speed (Exposure time) | 0.04~750 | | | | ms |
| Hardware Gains | 12 | | | | dB |
| Trigger Mode | With external trigger | | | | |
| Lens mount | C– mount or CS-mount<br>(M12.5-mount or custom-defined lens mount supported) | | | | |
| Built-in Filters | IR-cut (factory standard), No filter, or IR-pass | | | | |
| Power consumption | < 1.0 (excluding LED drivers, if applicable) | | | | W |
| Number of LED Driver Channels | N.A. | 4 | N.A. | 4 | |
| LED Driver Max. Output Voltage | N.A. | 5 | N.A. | 5 | V |
| LED Driver Max. Output Current (total) | N.A. | 250 | N.A. | 250 | mA |
| Dimension | 51 x 51 x 29 (CS-mount)<br>51 x 51 x 34 (C-mount) | | 58 x 58 x 34 (CS-mount)<br>58 x 58 x 39 (C-mount) | | mm |
| Weight (excluding lens) | 48 | | 150 | | g |

## Unbuffered USB2.0 Color 3MP CMOS Cameras (M-Series)

Mightex USB 2.0 cameras are designed for a wide variety of applications (such as industrial inspections, digital microscopy and medical imaging), which require good quality cameras that are easy to use and cost-effective. With a USB2.0 interface and powerful PC software, the camera delivers excellent quality images, and the frame rate can be as high as 7 fps at full resolution and up to 600 fps using ROI mode. In addition, a user-friendly GUI based application software and a SDK are provided for custom software development. The cameras have 4-pin GPIOs and optional built-in LED drivers. A DirectShow driver and a TWAIN driver are also provided to easily link the cameras with users' applications.

### PERFORMANCE SPECIFICATIONS

| Parameters | MCN-C030-U | GLN-C030-U | MCE-C030-U | MLE-C030-U | Unit |
|---|---|---|---|---|---|
| Board-level/enclosed | Board-level | Board-level | Enclosed | Enclosed | |
| Number of GPIOs | 4 | 4 | 4 | No | |
| Built-in LED Drivers | No | Yes | No | Yes | |
| Resolution | 2048x1536 color | | | | |
| CMOS Chip | ½" Aptina MT9T001, rolling shutter | | | | |
| Pixel Size | 3.2 x 3.2 | | | | µm |
| Scanning System | Progressive | | | | |
| Dynamic Range | 61 | | | | dB |
| Sensor SNR | 43 | | | | dB |
| Color (RGB) | 8 | | | | bit |
| Frame Rates (@48MHz Clock) | 7 @2048x1536, 11 @1600x1200, 16 @1280x1024, 26 @1024x768, 35 @800x600, 50 @640x480, 80 @320x240, 130 @160x120, 175 @64x64 | | | | fps |
| Sub Resolutions | 1600x1200, 1280x1024, 1024x768, 800x600, 640x480, 320x240, 160x120, 64x64 | | | | |
| Shutter Speed (Exposure time) | 0.04~750 | | | | ms |
| Hardware Gains | 12 | | | | dB |
| Trigger Mode | With external trigger | | | | |
| Lens mount | C– mount or CS-mount (M12.5-mount or custom-defined lens mount supported) | | | | |
| Built-in Filters | IR-cut (factory standard), IR-pass or no filter | | | | |
| Power consumption | < 1.0 (excluding LED drivers, if applicable) | | | | W |
| Number of LED Driver Channels | N.A. | 4 | N.A. | 4 | |
| LED Driver Maximum Output Voltage | N.A. | 5 | N.A. | 5 | V |
| LED Driver Maximum Output Current (total) | N.A. | 250 | N.A. | 250 | mA |
| Dimension | 51 x 51 x 29 (CS-mount)<br>51 x 51 x 34 (C-mount) | | 58 x 58 x 34 (CS-mount)<br>58 x 58 x 39 (C-mount) | | mm |
| Weight (excluding lens) | 48 | | 150 | | g |

## Buffered USB2.0 Mono 752x480 CMOS Cameras 8-bit (B-Series)

Mightex USB2.0 cameras with frame buffers are optimized for machine-vision applications, and they can be also used for a wide variety of applications (such as industrial inspections, digital microscopy and medical imaging), which require good quality cameras that are easy to use and cost-effective. These cameras have built-in frame buffers, external trigger-in, strobe-out, and a powerful camera engine that supports multiple cameras. Monochrome cameras often exhibit 20% higher spatial resolution than their color counterparts because no pixel interpolation is necessary. Since there is no *Bayer color filter* on the sensor, monochrome cameras are more sensitive than color sensors, especially in near IR and UV regions. Frame rate can be as high as 60 fps in full resolution and up to 600 fps using ROI mode. A user-friendly GUI based application software and an SDK are provided for custom software development. In addition, a DirectShow driver and a TWAIN driver are available to easily link the cameras with users' applications. A USB command set protocol and a Linux driver are also provided for non-Windows based applications.

### PERFORMANCE SPECIFICATIONS

| Parameters | BCN-BG04-U | BCE-BG04-U | Unit |
|---|---|---|---|
| Board-level/enclosed | Board-level | Enclosed | |
| Number of GPIOs | 4 | 4 | |
| Resolution | 752x480 Monochrome | | |
| CMOS Chip | 1/3" Aptina MT9V032, global shutter | | |
| Pixel Size | 6.0x6.0 | | μm |
| Scanning System | Progressive | | |
| Dynamic Range | >55 | | dB |
| Gray Level | 8 | | bit |
| Responsivity | 4.8 | | V/lux-sec |
| On-board Memory ("Frame Buffers") | 32 | | MB |
| Frame Rates(@26MHz Clock) | 60 @752x480, 65 @640x480, 130 @320x240<br>220 @160x120, 310 @64 x 64 | | fps |
| Sub Resolutions | Support arbitrary ROI (Nx, Ny), with Nx and Ny multiples of 4 | | |
| Shutter Speed (Exposure time) | 0.05 ~ 750 | | ms |
| Hardware Gains | 1x ~ 4x | | |
| Trigger Mode | With external trigger | | |
| Strobe Out | Yes | | |
| Lens mount | C– mount or CS-mount<br>(M12.5-mount or custom-defined lens mount supported) | | |
| Built-in Filters | IR-cut (factory standard), or IR-pass, or no filter | | |
| Power consumption | < 1.8 | | W |
| Dimension | 51 x 51 x 29 (CS-mount)<br>51 x 51 x 34 (C-mount) | 58 x 58 x 34 (CS-mount)<br>58 x 58 x 39 (C-mount) | mm |
| Weight (excluding lens) | 80 | 150 | g |

## Buffered USB2.0 Color 752x480 CMOS Cameras (B-Series)

Mightex USB 2.0 cameras are designed for a wide variety of applications (such as industrial inspections, digital microscopy and medical imaging) which require good quality cameras that are easy to use and cost-effective. With a USB2.0 interface and powerful PC software, the camera delivers excellent quality images, and the frame rate can be as high as 60 fps in full resolution and up to 600 fps using ROI mode. In addition, a user-friendly GUI based application software and a SDK are provided for custom software development. A DirectShow driver and a TWAIN driver are available to easily link the cameras with users' applications. For non-Windows based applications, a USB command set protocol and a Linux driver are also provided.

### PERFORMANCE SPECIFICATIONS

| Parameters | BCN-CG04-U | BCE-CG04-U | Unit |
|---|---|---|---|
| Board-level/enclosed | Board-level | Enclosed | |
| Number of GPIOs | 4 | 4 | |
| Resolution | 752x480 color | | |
| CMOS Chip | 1/3" Aptina MT9V032, global shutter | | |
| Pixel Size | 6.0x6.0 | | µm |
| Scanning System | Progressive | | |
| Dynamic Range | >55 | | dB |
| Gray Level | 8 | | bit |
| Responsivity | 4.8 | | V/lux-sec |
| On-board Memory ("Frame Buffers") | 32dddccvd | | MB |
| Frame Rates (@26MHz Clock) | 60 @752x480, 65 @640x480<br>130 @320x240, 220 @160x120, 310 @64x64 | | fps |
| Sub Resolutions | Support arbitrary ROI (Nx, Ny), with Nx and Ny multiples of 4 | | |
| Shutter Speed (Exposure time) | 0.05 ~ 750 | | ms |
| Hardware Gains | 1x ~ 4x | | |
| Trigger Mode | With external trigger | | |
| Strobe Out | Yes | | |
| Lens mount | C– mount or CS-mount<br>(M12.5-mount or custom-defined lens mount supported) | | |
| Built-in Filters | IR-cut (factory standard), or IR-pass, or no filter | | |
| Power consumption | < 1.8 | | W |
| Dimension | 51 x 51 x 29 (CS-mount)<br>51 x 51 x 34 (C-mount) | 58 x 58 x 34 (CS-mount)<br>58 x 58 x 39 (C-mount) | mm |
| Weight (excluding lens) | 80 | 150 | g |

## Buffered USB2.0 Monochrome 752x480 CMOS Cameras 10-bit (B-Series)

Mightex USB2.0 cameras with frame buffers are optimized for machine-vision applications, and they can be also used for a wide variety of applications (such as industrial inspections, digital microscopy and medical imaging), which require good quality cameras that are easy to use and cost-effective. These cameras have built-in frame buffers, external trigger-in, strobe-out, and a powerful camera engine that supports multiple cameras. Monochrome cameras often exhibit 20% higher spatial resolution than their color counterparts because no pixel interpolation is necessary. Since there is no *Bayer color filter* on the sensor, monochrome cameras are more sensitive than color sensors, especially in near IR and UV regions. Frame rate can be as high as 60 fps in full resolution and up to 600 fps using ROI mode. A user-friendly GUI based application software and an SDK are provided for custom software development. In addition, a DirectShow driver and a TWAIN driver are available to easily link the cameras with users' applications. A USB command set protocol and a Linux driver are also provided for non-Windows based applications.

### PERFORMANCE SPECIFICATIONS

| Parameters | BTN-BG04-U | BTE-BG04-U | Unit |
|---|---|---|---|
| Board-level/enclosed | Board-level | Enclosed | |
| Number of GPIOs | 4 | 4 | |
| Resolution | 752x480 Monochrome | | |
| CMOS Chip | 1/3" Aptina MT9V032, global shutter | | |
| Pixel Size | 6.0 x 6.0 | | μm |
| Scanning System | Progressive | | |
| Dynamic Range | >55 | | dB |
| Gray Level | 10 | | bit |
| Responsivity | 4.8 | | V/lux-sec |
| On-board Memory ("Frame Buffers") | 32 | | MB |
| Frame Rates (@26MHz Clock) | 8 bit operation mode: 60 @752x480, 65 @640x480, 130 @320x240 220 @160x120, 310 @64 x 64 | | fps |
| | 10 bit operation mode: 36 @752x480, 44 @640x480, 130 @320x240 220 @160x120, 310 @64 x 64 | | |
| Sub Resolutions | Support arbitrary ROI (Nx, Ny), with Nx and Ny multiples of 4 | | |
| Shutter Speed (Exposure time) | 0.05 ~ 750 | | ms |
| Hardware Gains | 1x ~ 4x | | |
| Trigger Mode | With external trigger | | |
| Strobe Out | Yes | | |
| Lens mount | C– mount or CS-mount (M12.5-mount or custom-defined lens mount supported) | | |
| Built-in Filters | IR-cut (factory standard), or IR-pass, or no filter | | |
| Power consumption | < 1.8 | | W |
| Dimension | 51 x 51 x 29 (CS-mount) 51 x 51 x 34 (C-mount) | 58 x 58 x 34 (CS-mount) 58 x 58 x 39 (C-mount) | mm |
| Weight (excluding lens) | 80 | 150 | g |

## Buffered USB2.0 Monochrome 1.3MP CMOS Cameras 8-bit (B-Series)

Mightex USB2.0 cameras with frame buffers are optimized for machine-vision applications, and they can be also used for a wide variety of applications (such as industrial inspections, digital microscopy and medical imaging), which require good quality cameras that are easy to use and cost-effective. These cameras have built-in frame buffers, external trigger-in, strobe-out, and a powerful camera engine that supports multiple cameras. Monochrome cameras often exhibit 20% higher spatial resolution than their color counterparts because no pixel interpolation is necessary. Since there is no *Bayer color filter* on the sensor, monochrome cameras are more sensitive than color sensors, especially in near IR and UV regions.

Frame rate can be as high as 25 fps in full resolution and up to 300 fps using ROI mode. A user-friendly GUI based application software and an SDK are provided for custom software development. In addition, a DirectShow driver and a TWAIN driver are available to easily link the cameras with users' applications. A USB command set protocol and a Linux driver are also provided for non-Windows based applications.

### PERFORMANCE SPECIFICATIONS

| Parameters | BCN-B013-U | BCE-B013-U | Unit |
|---|---|---|---|
| Board-level/enclosed | Board-level | Enclosed | |
| Number of GPIOs | 4 | 4 | |
| Resolution | 1280x1024 monochrome | | |
| CMOS Chip | ½" (5:4) Aptina MT9M001, rolling shutter | | |
| Pixel Size | 5.2 x 5.2 | | µm |
| Active Imager Size | 6.66 x 5.32 | | mm |
| Scanning System | Progressive | | |
| Dynamic Range | 68 | | dB |
| Sensor SNR | 45 | | dB |
| Gray Level | 8 | | bit |
| Responsivity | 2.1 | | V/lux-sec |
| On-board Memory ("Frame Buffers") | 32 | | MB |
| Frame Rates (@48MHz Clock) | 25 @1280x1024, 35 @1024x768, 50 @800x600, 55 @752x480, 65 @640x480, 140 @320x240 | | fps |
| Sub Resolutions | Support arbitrary ROI (Nx, Ny), with Nx and Ny multiples of 4 | | |
| Shutter Speed (Exposure time) | 0.05 ~ 750 | | ms |
| Hardware Gains | 0.125x ~ 8x | | |
| Trigger Mode | With external trigger | | |
| Strobe Out | Yes | | |
| Lens mount | C– mount or CS-mount (M12.5-mount or custom-defined lens mount supported) | | |
| Built-in Filters | IR-cut (factory standard), IR-pass, or no filter | | |
| Power consumption | < 1.8 | | W |
| Dimension | 51 x 51 x 29 (CS-mount) 51 x 51 x 34 (C-mount) | 58 x 58 x 34 (CS-mount) 58 x 58 x 39 (C-mount) | mm |
| Weight (excluding lens) | 80 | 150 | g |

## Buffered USB2.0 Monochrome 1.3MP CMOS Cameras 10-bit (B-Series)

Mightex USB2.0 cameras with frame buffers are optimized for machine-vision applications, and they can be also used for a wide variety of applications (such as industrial inspections, digital microscopy and medical imaging), which require good quality cameras that are easy to use and cost-effective. These cameras have built-in frame buffers, external trigger-in, strobe-out, and a powerful camera engine that supports multiple cameras. Monochrome cameras often exhibit 20% higher spatial resolution than their color counterparts because no pixel interpolation is necessary. Since there is no *Bayer color filter* on the sensor, monochrome cameras are more sensitive than color sensors, especially in near IR and UV regions. Frame rate can be as high as 12 fps in full resolution and up to 150 fps using ROI mode. A user-friendly GUI based application software and an SDK are provided for custom software development. In addition, a DirectShow driver and a TWAIN driver are available to easily link the cameras with users' applications. A USB command set protocol and a Linux driver are also provided for non-Windows based applications.

### PERFORMANCE SPECIFICATIONS

| Parameters | BTN-B013-U | BTE-B013-U | Unit |
|---|---|---|---|
| Board-level/enclosed | Board-level | Enclosed | |
| Number of GPIOs | 4 | 4 | |
| Resolution | 1280x1024 Monochrome | | |
| CMOS Chip | ½" (5:4) Aptina MT9M001, Rolling Shutter | | |
| Pixel Size | 5.2 x 5.2 | | µm |
| Active Imager Size | 6.66 x 5.32 | | mm |
| Scanning System | Progressive | | |
| Dynamic Range | 68 | | dB |
| Sensor SNR | 45 | | dB |
| Gray Level | 10 | | bit |
| Responsivity | 2.1 | | V/lux-sec |
| On-board Memory ("Frame Buffers") | 32 | | MB |
| Frame Rates (@48MHz Clock) | 12 @1280x1024, 18 @1024x768, 25 @800x600<br>28 @752x480, 33 @640x480, 70 @320x240 | | fps |
| Sub Resolutions | Support arbitrary ROI (Nx, Ny), with Nx and Ny multiples of 4 | | |
| Shutter Speed (Exposure time) | 0.05 ~ 750 | | ms |
| Hardware Gains | 0.125x ~ 8x | | |
| Trigger Mode | With external trigger | | |
| Strobe Out | Yes | | |
| Lens mount | C– mount or CS-mount<br>(M12.5-mount or custom-defined lens mount supported) | | |
| Built-in Filters | IR-cut (factory standard), IR-pass, or no filter | | |
| Power consumption | < 1.8 | | W |
| Dimension | 51 x 51 x 29 (CS-mount)<br>51 x 51 x 34 (C-mount) | 58 x 58 x 34 (CS-mount)<br>58 x 58 x 39 (C-mount) | mm |
| Weight (excluding lens) | 80 | 150 | g |

## Buffered USB2.0 Color 3MP CMOS Cameras (B-Series)

Mightex USB 2.0 cameras are designed for a wide variety of applications (such as industrial inspections, digital microscopy and medical imaging), which require good quality cameras that are easy to use and cost-effective. With a USB2.0 interface and powerful PC software, the camera delivers excellent quality images, and the frame rate can be as high as 8 fps in full resolution and up to 300 fps using ROI mode. In addition, a user-friendly GUI based application software and a SDK are provided for custom software development. A DirectShow driver and a TWAIN driver are available to easily link the cameras with users' applications. For non-Windows based applications, a USB command set protocol and a Linux driver are also provided.

### PERFORMANCE SPECIFICATIONS

| Parameters | BCN-C030-U | BCE-C030-U | Unit |
|---|---|---|---|
| Board-level/enclosed | Board-level | Enclosed | |
| Number of GPIOs | 4 | 4 | |
| Resolution | 2048 x 1536 color | | |
| CMOS Chip | ½" (5:4) Aptina MT9T001, rolling shutter | | |
| Pixel Size | 3.2 x 3.2 | | µm |
| Scanning System | Progressive | | |
| Dynamic Range | 61 | | dB |
| Sensor SNR | 43 | | dB |
| Gray Level | 8 | | bit |
| Responsivity | 2.1 | | V/lux-sec |
| On-board Memory ("Frame Buffers") | 32 | | MB |
| Frame Rates (@48MHz Clock) | 8 @2048x1536, 14 @1600x1200, 25 @1280x1024<br>35 @1024x768, 50 @800x600, 55 @752x480<br>65 @640x480, 140 @320x240 | | fps |
| Sub Resolutions | Support arbitrary ROI (Nx, Ny), with Nx and Ny multiples of 4 | | |
| Shutter Speed (Exposure time) | 0.05 ~ 750 | | ms |
| Hardware Gains | 0.125x ~ 8x | | |
| Trigger Mode | With external trigger | | |
| Strobe Out | Yes | | |
| Lens mount | C– mount or CS-mount<br>(M12.5-mount or custom-defined lens mount supported) | | |
| Built-in Filters | IR-cut (factory standard), or IR-pass, or no filter | | |
| Power consumption | < 1.8 | | W |
| Dimension | 51 x 51 x 29 (CS-mount)<br>51 x 51 x 34 (C-mount) | 58 x 58 x 34 (CS-mount)<br>58 x 58 x 39 (C-mount) | mm |
| Weight (excluding lens) | 80 | 150 | g |

## Buffered USB2.0 Monochrome 5MP CMOS Cameras 8-bit (B-Series)

Mightex USB2.0 cameras with frame buffers are optimized for machine-vision applications, and they can be also used for a wide variety of applications (such as industrial inspections, digital microscopy and medical imaging) which require good quality cameras that are easy to use and cost-effective. These cameras have built-in frame buffers, external trigger-in, strobe-out, and a powerful camera engine that supports multiple cameras. Monochrome cameras often exhibit 20% higher spatial resolution than their color counterparts because no pixel interpolation is necessary. Since there is no *Bayer color filter* on the sensor, monochrome cameras are more sensitive than color sensors, especially in near IR and UV regions. Frame rate can be as high as 6 fps in full resolution and up to 150 fps using ROI mode. A user-friendly GUI based application software and an SDK are provided for custom software development. In addition, a DirectShow driver and a TWAIN driver are available to easily link the cameras with users' applications. A USB command set protocol and a Linux driver are also provided for non-Windows based applications.

### PERFORMANCE SPECIFICATIONS

| Parameters | BCN-B050-U | BCE-B050-U | Unit |
|---|---|---|---|
| Board-level/enclosed | Board-level | Enclosed | |
| Number of GPIOs | 4 | 4 | |
| Resolution | 2592 x 1944 Monochrome | | |
| CMOS Chip | Aptina MT9P031, rolling shutter | | |
| Pixel Size | 2.2 x 2.2 | | µm |
| Scanning System | Progressive | | |
| Dynamic Range | 70 | | dB |
| Sensor SNR | 38 | | dB |
| Gray Level | 8 | | bit |
| Responsivity | 1.4 | | V/lux-sec |
| Frame Rates (@48MHz Clock) | 6 @2592x1944, 9 @2048x1536, 13 @1600x1200, 18 @1280x1024, 28 @1024x768, 40 @800x600, 50 @752x480, 56 @640x480, and 100 @320x240 | | fps |
| Sub Resolutions | Support arbitrary ROI (Nx, Ny), with Nx and Ny multiples of 4 | | |
| Shutter Speed (Exposure time) | 0.05 ~ 750 | | ms |
| Hardware Gains | 1x ~ 16x | | |
| Trigger Mode | With external trigger | | |
| Strobe Out | Yes | | |
| Lens mount | C– mount and CS-mount<br>(M12.5-mount or custom-defined lens mount supported) | | |
| Built-in Filters | IR-cut (factory standard), or IR-pass, or no filter | | |
| Power consumption | < 1.8 | | W |
| Dimension | 51 x 51 x 29 (CS-mount)<br>51 x 51 x 34 (C-mount) | 58 x 58 x 34 (CS-mount)<br>58 x 58 x 39 (C-mount) | mm |
| Weight (excluding lens) | 80 | 150 | g |

## Buffered USB2.0 Color 5MP CMOS Cameras (B-Series)

Mightex USB 2.0 cameras are designed for a wide variety of applications (such as industrial inspections, digital microscopy and medical imaging), which require good quality cameras that are easy to use and cost-effective. With a USB2.0 interface and powerful PC software, the camera delivers excellent quality images, and the frame rate can be as high as 6 fps in full resolution and up to 600 fps using ROI mode. In addition, a user-friendly GUI based application software and a SDK are provided for custom software development. A DirectShow driver and a TWAIN driver are available to easily link the cameras with users' applications. For non-Windows based applications, a USB command set protocol and a Linux driver are also provided.

### PERFORMANCE SPECIFICATIONS

| Parameters | BCN-C050-U | BCE-C050-U | Unit |
|---|---|---|---|
| Board-level/enclosed | Board-level | Enclosed | |
| Number of GPIOs | 4 | 4 | |
| Resolution | 2592 x 1944 color | | |
| CMOS Chip | Aptina MT9P031, rolling shutter | | |
| Pixel Size | 2.2 x 2.2 | | µm |
| Scanning System | Progressive | | |
| Dynamic Range | 70 | | dB |
| Sensor SNR | 38 | | dB |
| Gray Level | 8 | | bit |
| Responsivity | 1.4 | | V/lux-sec |
| Frame Rates (@48MHz Clock) | 6 @2592x1944, 9 @2048x1536, 13 @1600x1200, 18 @1280x1024, 28 @1024x768, 40 @800x600, 50 @752x480, 56 @640x480, 100 @320x240 | | fps |
| Sub Resolutions | Support arbitrary ROI (Nx, Ny), with Nx and Ny multiples of 4 | | |
| Shutter Speed (Exposure time) | 0.05 ~ 750 | | ms |
| Hardware Gains | 1x ~ 16x | | |
| Trigger Mode | With external trigger | | |
| Strobe Out | Yes | | |
| Lens mount | C– mount or CS-mount (M12.5-mount or custom-defined lens mount supported) | | |
| Built-in Filters | IR-cut (factory standard), or IR-pass, or no filter | | |
| Power consumption | < 1.8 | | W |
| Dimension | 51 x 51 x 29 (CS-mount)<br>51 x 51 x 34 (C-mount) | 58 x 58 x 34 (CS-mount)<br>58 x 58 x 39 (C-mount) | mm |
| Weight (excluding lens) | 80 | 150 | g |

## Buffered USB2.0 Monochrome 5MP CMOS Cameras 12-bit (B-Series)

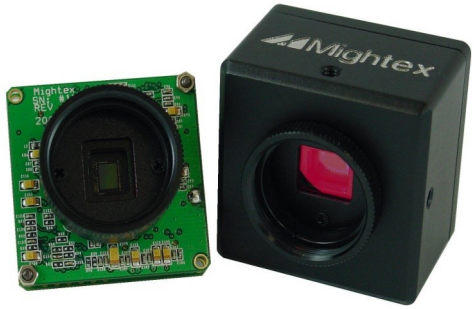
Mightex USB2.0 cameras with frame buffers are optimized for machine-vision applications, and they can be also used for a wide variety of applications (such as industrial inspections, digital microscopy and medical imaging) which require good quality cameras that are easy to use and cost-effective. These cameras have built-in frame buffers, external trigger-in, strobe-out, and a powerful camera engine that supports multiple cameras. Monochrome cameras often exhibit 20% higher spatial resolution than their color counterparts because no pixel interpolation is necessary. Since there is no *Bayer color filter* on the sensor, monochrome cameras are more sensitive than color sensors, especially in near IR and UV regions. Frame rate can be as high as 6 fps in full resolution and up to 150 fps using ROI mode. A user-friendly GUI based application software and an SDK are provided for custom software development. In addition, a DirectShow driver and a TWAIN driver are available to easily link the cameras with users' applications. A USB command set protocol and a Linux driver are also provided for non-Windows based applications.

### PERFORMANCE SPECIFICATIONS

| Parameters | BTN-B050-U | BTE-B050-U | Unit |
|---|---|---|---|
| Board-level/enclosed | Board-level | Enclosed | |
| Number of GPIOs | 4 | 4 | |
| Resolution | 2592 x 1944 Monochrome | | |
| Bit | 8/12 (switchable) | | bits |
| CMOS Chip | Aptina MT9P031, rolling shutter | | |
| Pixel Size | 2.2 x 2.2 | | µm |
| Scanning System | Progressive | | |
| Dynamic Range | 70 | | dB |
| Sensor SNR | 38 | | dB |
| Gray Level | 8 | | bit |
| Responsivity | 1.4 | | V/lux-sec |
| Frame Rates (@48MHz Clock) | 3 @2592x1944, 5 @2048x1536, 7 @1600x1200 , 12 @1280x1024, 21 @1024x768 , 33 @800x600, 43 @752x480, 51 @640x480, and 100 @320x240 | | fps |
| Sub Resolutions | Support arbitrary ROI (Nx, Ny), with Nx and Ny multiples of 4 | | |
| Shutter Speed (Exposure time) | 0.05 ~ 750 | | ms |
| Hardware Gains | 1x ~ 16x | | |
| Trigger Mode | With external trigger | | |
| Strobe Out | Yes | | |
| Lens mount | C– mount and CS-mount<br>(M12.5-mount or custom-defined lens mount supported) | | |
| Built-in Filters | IR-cut (factory standard), or IR-pass, or no filter | | |
| Power consumption | < 1.8 | | W |
| Dimension | 51 x 51 x 29 (CS-mount)<br>51 x 51 x 34 (C-mount) | 58 x 58 x 34 (CS-mount)<br>58 x 58 x 39 (C-mount) | mm |
| Weight (excluding lens) | 80 | 150 | g |

## Buffered USB2.0 Monochrome 1.3MP CCD Cameras (C-series)

Mightex USB2.0 CCD cameras with frame buffers are optimized for machine-vision applications, and they can be also used for a wide variety of applications (such as industrial inspections, digital microscopy and medical imaging), which require good quality cameras that are easy to use and cost-effective. These cameras have built-in frame buffers, external trigger-in, strobe-out, and a powerful camera engine that supports multiple cameras. Monochrome cameras often exhibit 20% higher spatial resolution than their color counterparts because no pixel interpolation is necessary. Since there is no *Bayer color filter* on the sensor, monochrome cameras are more sensitive than color sensors, especially in near IR and UV regions. Frame rate can be as high as 20 fps in full resolution and up to 84 fps using ROI mode. A user-friendly GUI based application software and an SDK are provided for custom software development. In addition, a DirectShow driver and a TWAIN driver are available to easily link the cameras with users' applications. A USB command set protocol and a Linux driver are also provided for non-Windows based applications.

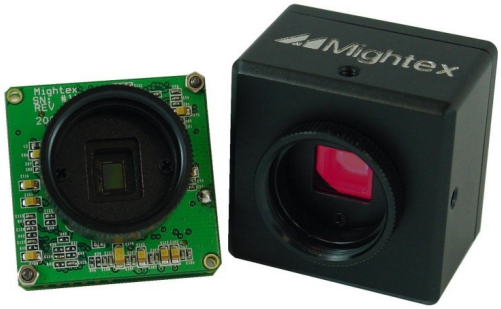



### PERFORMANCE SPECIFICATIONS

| Parameters | CGN-B013-U | CGE-B013-U | Unit |
|---|---|---|---|
| Board-level / enclosed | Board-level | Enclosed | |
| Number of GPIOs | 4 | 4 | |
| Resolution | 1280x960 monochrome | | |
| Bit | 8/12 | | bits |
| CCD Chip | 1/3" Sony ICX445AL, Global Shutter | | |
| Pixel Size | 3.75x3.75 | | µm |
| Active Imager Size | 6.26x5.01 | | mm |
| Scanning System | Progressive | | |
| Frame Rates (@32MHz Clock) | 20 @1280 x 960, 38 @640 x 480 (2x2 Bin), 53 @424 x 320 (3x3 Bin), 66 @320 x 240 (4x4 Bin), 66 @320 x 240 (4x4 Bin2) | | fps |
| Sub Resolutions | 640 x 480 (2x2 Bin), 424 x 320 (3x3 Bin), 320 x 240 (4x4 Bin), 320 x 240 (1:4 Skip)** | | |
| Shutter Speed (Exposure time) | 0.05 ~ 200,000 | | ms |
| Hardware Gains | 6 ~ 41 | | dB |
| Trigger Mode | With external trigger | | |
| Trigger Delay | <25 | | µs |
| Strobe Out | Yes | | |
| Lens mount | CS– mount or C-mount | | |
| Built-in Filters | IR-cut (factory standard), IR-pass or No filter | | |
| Power consumption | < 1.8 | | W |
| Dimension | 40 x 40 x 31 (CS-mount)<br>40 x 40 x 36 (C-mount) | 45 x 45 x 30.5 (CS-mount)<br>45 x 45 x 35.5 (C-mount) | mm |
| Weight (excluding lens) | 29 | 115 | g |

## Buffered USB2.0 Color 1.3MP CCD Cameras (C-Series)

Mightex USB2.0 CCD cameras with frame buffers are optimized for machine-vision applications, and they can be also used for a wide variety of applications (such as industrial inspections, digital microscopy and medical imaging) which require good quality cameras that are easy to use and cost-effective. These cameras have built-in frame buffers, external trigger-in, strobe-out, and a powerful camera engine that supports multiple cameras. Frame rate can be as high as 20 fps in full resolution and up to 84 fps using ROI mode. A user-friendly GUI based application software and an SDK are provided for custom software development. In addition, a DirectShow driver and a TWAIN driver are available to easily link the cameras with users' applications. A USB command set protocol and a Linux driver are also provided for non-Windows based applications.

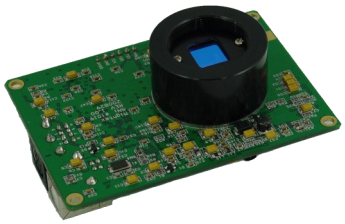



### PERFORMANCE SPECIFICATIONS

| Parameters | CGN-C013-U | CGE-C013-U | Unit |
|---|---|---|---|
| Board-level / enclosed | Board-level | Enclosed | |
| Number of GPIOs | 4 | 4 | |
| Resolution | 1280x960 Color (RGB Bayer Filter) | | |
| Bit | 8/12 | | bits |
| CCD Chip | 1/3" Sony ICX445AK, Global Shutter | | |
| Pixel Size | 3.75x3.75 | | µm |
| Active Imager Size | 6.26x5.01 | | mm |
| Scanning System | Progressive | | |
| Frame Rates (@32MHz Clock) | 20 @1280 x 960, 38 @640 x 480 (2x2 Bin), 53 @424 x 320 (3x3 Bin), 66 @320 x 240 (4x4 Bin), 66 @320 x 240 (4x4 Bin2) | | fps |
| Sub Resolutions | 640 x 480 (2x2 Bin), 424 x 320 (3x3 Bin), 320 x 240 (4x4 Bin), 320 x 240 (1:4 Bin2) | | |
| Shutter Speed (Exposure time) | 0.05 ~ 200,000 | | ms |
| Hardware Gains | 6 ~ 41 | | dB |
| Trigger Mode | With external trigger | | |
| Trigger Delay | <25 | | µs |
| Strobe Out | Yes | | |
| Lens mount | CS– mount or C-mount | | |
| Built-in Filters | IR-cut (factory standard), IR-pass or No filter | | |
| Power consumption | < 1.8 | | W |
| Dimension | 40 x 40 x 31 (CS-mount)<br>40 x 40 x 36 (C-mount) | 45 x 45 x 30.5 (CS-mount)<br>45 x 45 x 35.5 (C-mount) | mm |
| Weight (excluding lens) | 29 | 115 | g |

## Buffered USB2.0 Monochrome 1.4MP CCD Cameras (C-Series)

Mightex USB2.0 cameras with frame buffers are optimized for machine-vision applications, and they can be also used for a wide variety of applications (such as industrial inspections, digital microscopy and medical imaging), which require good quality cameras that are easy to use and cost-effective. These cameras have built-in frame buffers, external trigger-in, strobe-out, and a powerful camera engine that supports multiple cameras. Monochrome cameras often exhibit 20% higher spatial resolution than their color counterparts because no pixel interpolation is necessary. Since there is no *Bayer color filter* on the sensor, monochrome cameras are more sensitive than color sensors, especially in near IR and UV regions. Frame rate can be as high as 15 fps in full resolution and up to 80 fps using ROI mode. A user-friendly GUI based application software and an SDK are provided for custom software development. In addition, a DirectShow driver and a TWAIN driver are available to easily link the cameras with users' applications. A USB command set protocol and a Linux driver are also provided for non-Windows based applications.



### PERFORMANCE SPECIFICATIONS

| Parameters | CCN-B013-U | CCE-B013-U | Unit |
|---|---|---|---|
| Board-level/enclosed | Board-level | Enclosed | |
| Number of GPIOs | 4 | 4 | |
| Resolution | 1392x1040 monochrome | | |
| Bit | 8/12 | | bits |
| CCD Chip | ½" Sony ICX205AL, Global shutter | | |
| Pixel Size | 4.65x4.65 | | μm |
| Active Imager Size | 7.60x6.20 | | mm |
| Scanning System | Progressive | | |
| Frame Rates (@28MHz Clock) | 15 @1392 x 1040, 29 @696 x 520 (2x2 Bin), 37 @464 x 344 (3x3 Bin), 49 @348 x 256 (4x4 Bin), 49 @348 x 256 (1:4 Skip) | | fps |
| Sub Resolutions | 696 x 520(2x2 Bin), 464 x 344 (3x3 Bin), 348 x 256 (4x4 Bin), 348 x 256 (1:4 Skip) | | |
| Shutter Speed (Exposure time) | 0.05 ~ 200,000 | | ms |
| Hardware Gains | 6 ~ 43 | | dB |
| Trigger Mode | With external trigger | | |
| Trigger Delay | <25 | | ms |
| Strobe Out | Yes | | |
| Lens mount | CS– mount or C-mount | | |
| Built-in Filters | IR-cut (factory standard), IR-pass or No filter | | |
| Power consumption | < 1.8 | | W |
| Dimension | 89 x 64 x 34 (CS-mount)<br>89 x 64 x 39 (C-mount) | 95 x 70 x 38.5 (CS-mount)<br>95 x 70 x 43.5 (C-mount) | mm |
| Weight (excluding lens) | 80 | 150 | g |

## Buffered USB2.0 Color 1.4MP CCD Cameras (C-Series)

Mightex USB 2.0 CCD cameras with frame buffers are optimized for machine-vision applications, and they can be also used for a wide variety of applications (such as industrial inspections, digital microscopy and medical imaging), which require good quality cameras that are easy to use and cost-effective. These cameras have built-in frame buffers, external trigger-in, strobe-out, and a powerful camera engine that supports multiple cameras. Frame rate can be as high as 15 fps in full resolution and up to 80 fps using ROI mode. A user-friendly GUI based application software and an SDK are provided for custom software development. In addition, a DirectShow driver and a TWAIN driver are available to easily link the cameras with users' applications. A USB command set protocol and a Linux driver are also provided for non-Windows based applications.

### PERFORMANCE SPECIFICATIONS

| Parameters | CCN-C013-U | CCE-C013-U | Unit |
|---|---|---|---|
| Board-level/enclosed | Board-level | Enclosed | |
| Number of GPIOs | 4 | 4 | |
| Resolution | 1392x1040 Color | | |
| Bit | 8/12 | | bits |
| CCD Chip | ½" Sony ICX205AK, Global shutter | | |
| Pixel Size | 4.65x4.65 | | µm |
| Active Imager Size | 7.60x6.20 | | mm |
| Scanning System | Progressive | | |
| Frame Rates (@28MHz Clock) | 15 @1392 x 1040, 49 @348 x 256 (1:4 Skip)*, Resolution dependent @ ROI | | fps |
| Sub Resolutions | 348 x 256 (1:4 Skip) | | |
| Shutter Speed (Exposure time) | 0.05 ~ 200,000 | | ms |
| Hardware Gains | 6 ~ 43 | | dB |
| Trigger Mode | With external trigger | | |
| Trigger Delay | <25 | | µs |
| Strobe Out | Yes | | |
| Lens mount | CS– mount or C-mount | | |
| Built-in Filters | IR-cut (factory standard), IR-pass or No filter | | |
| Power consumption | < 1.8 | | W |
| Dimension | 89 x 64 x 34 (CS-mount)<br>89 x 64 x 39 (C-mount) | 95 x 70 x 38.5 (CS-mount)<br>95 x 70 x 43.5 (C-mount) | mm |
| Weight (excluding lens) | 80 | 150 | g |

## High-Sensitivity USB2.0 Monochrome 8/12-Bit 1.4MP 2/3" CCD Camera (C-Series)

Mightex USB 2.0 CCD cameras with frame buffers are optimized for machine-vision applications, and they can be also used for a wide variety of applications (such as industrial inspections, digital microscopy and medical imaging), which require good quality cameras that are easy to use and cost-effective. These cameras have built-in frame buffers, external trigger-in, strobe-out, and a powerful camera engine that supports multiple cameras. Monochrome cameras often exhibit 20% higher spatial resolution than their color counterparts because no pixel interpolation is necessary. Without a Bayer color filter on the sensor, monochrome cameras are also more sensitive than color sensors especially in near IR and UV regions. Frame rate can be as high as 15 fps in full resolution and up to 80 fps using ROI mode. In addition, a user-friendly GUI based application software and an SDK are provided for custom software development. A USB command set protocol is also provided for non-Windows based applications.

### PERFORMANCE SPECIFICATIONS

| Parameters | CXN-B013-U | CXE-B013-U | Unit |
|---|---|---|---|
| Board-level/enclosed | Board-level | Enclosed | |
| Number of GPIOs | 4 | 4 | |
| Resolution | 1392x1040 monochrome | | |
| Bit | 8/12 | | bits |
| CCD Chip | 2/3" Sony ICX285AL, Global shutter | | |
| Pixel Size | 6.45x6.45 | | μm |
| Active Imager Size | Diagonal 11.0 | | mm |
| Scanning System | Progressive | | |
| Frame Rates (@28MHz Clock) | 15 @1392 x 1040, 29 @696 x 520 (2x2 Bin), 37 @464 x 344 (3x3 Bin), 49 @348 x 256 (4x4 Bin), 49 @348 x 256 (1:4 Skip) | | fps |
| Sub Resolutions | 696 x 520 (2x2 Bin), 464 x 344 (3x3 Bin), 348 x 256 (4x4 Bin), 348 x 256 (1:4 Skip) | | |
| Shutter Speed (Exposure time) | 0.05~200,000 | | ms |
| Hardware Gains | 6~43 | | dB |
| Trigger Mode | With external trigger | | |
| Trigger Delay | <25 | | us |
| Strobe Out | Yes | | |
| Lens mount | CS– mount or C-mount | | |
| Built-in Filters | IR-cut (factory standard), IR-pass or no filter | | |
| Power consumption | < 1.8 | | W |
| Dimension | 89 x 64 x 34 (CS-mount)<br>89 x 64 x 39 (C-mount) | 95 x 70 x 38.5 (CS-mount)<br>95 x 70 x 43.5 (C-mount) | mm |
| Weight (excluding lens) | 80 | 150 | g |

## High-Sensitivity USB2.0 Color 8/12-Bit 1.4MP 2/3" CCD Camera (C-Series)

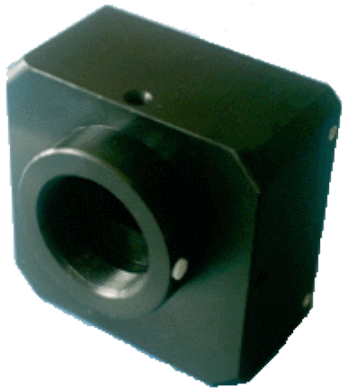
Mightex USB 2.0 CCD cameras with frame buffers are optimized for machine-vision applications, and they can be also used for a wide variety of applications (such as industrial inspections, digital microscopy and medical imaging), which require good quality cameras that are easy to use and cost-effective. These cameras have built-in frame buffers, external trigger-in, strobe-out, and a powerful camera engine that supports multiple cameras. Frame rate can be as high as 15 fps in full resolution and up to 80 fps using ROI mode. In addition, a user-friendly GUI based application software and an SDK are provided for custom software development. A USB command set protocol is also provided for non-Windows based applications.

### PERFORMANCE SPECIFICATIONS

| Parameters | CXN-C013-U | CXE-C013-U | Unit |
|---|---|---|---|
| Board-level/enclosed | Board-level | Enclosed | |
| Number of GPIOs | 4 | 4 | |
| Resolution | 1392x1040 color | | |
| Bit | 8/12 | | bits |
| CCD Chip | 2/3" Sony ICX285AQ, Global shutter | | |
| Pixel Size | 6.45x6.45 | | μm |
| Active Imager Size | Diagonal 11.0 | | mm |
| Scanning System | Progressive | | |
| Frame Rates (@28MHz Clock) | 15 @1392 x 1040, 49 @348 x 256 (1:4 Skip) | | fps |
| Sub Resolutions | 348 x 256 (1:4 Skip) | | |
| Shutter Speed (Exposure time) | 0.05~200,000 | | ms |
| Hardware Gains | 6~43 | | dB |
| Trigger Mode | With external trigger | | |
| Trigger Delay | <25 | | us |
| Strobe Out | Yes | | |
| Lens mount | CS– mount or C-mount | | |
| Built-in Filters | IR-cut (factory standard), IR-pass or No filter | | |
| Power consumption | < 1.8 | | W |
| Dimension | 89 x 64 x 34 (CS-mount)<br>89 x 64 x 39 (C-mount) | 95 x 70 x 38.5 (CS-mount)<br>95 x 70 x 43.5 (C-mount) | mm |
| Weight (excluding lens) | 80 | 150 | g |

## Windowless USB2.0 Monochrome 1.3MP CMOS Camera (8-bit)

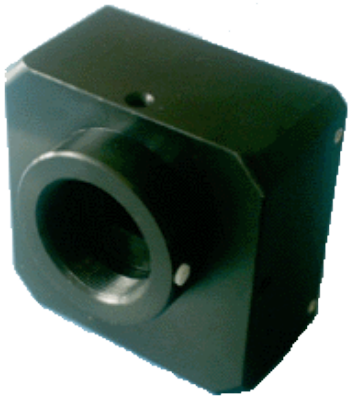
Mightex USB 2.0 monochrome cameras are designed for a wide variety of applications such as digital microscopy and medical imaging, where quality, ease of use, and cost-effectiveness are crucial. Monochrome cameras often exhibit 20% higher spatial resolution than their color counterparts because no pixel interpolation is necessary. Without a Bayer color filter on the sensor, monochrome cameras are also more sensitive than color sensors especially in near IR and UV regions. Frame rate can be as high as 22 fps in full resolution and up to 600 fps using ROI mode. In addition, a user-friendly GUI based application software and an SDK are provided for custom software development. The cameras have 4-pin GPIOs and a TWAIN driver, a DirectShow driver and a LabVIEW driver are also provided to easily link the cameras with users' applications. Window-less cameras are particularly useful for applications that are sensitive to multiple reflections due to the existence of the glass window in front of the CMOS sensor.



### PERFORMANCE SPECIFICATIONS

| Parameters | MCE-B013-UW and MCE-B013-UWS | Unit |
|---|---|---|
| Board-level/enclosed | Enclosed | |
| Number of GPIOs | 4 | |
| Resolution | 1280x1024 monochrome | |
| CMOS Chip | ½" (5:4) Aptina MT9M001 | |
| Pixel Size | 5.2 x 5.2 | μm |
| Active Imager Size | 6.66 x 5.32 | mm |
| Scanning System | Progressive | |
| Dynamic Range | 68 | dB |
| Sensor SNR | 45 | dB |
| Gray Level | 8 | bit |
| Responsivity | 2.1 | V/lux-sec |
| Frame Rates (@48MHz Clock) | 22 @1280x1024, 35 @1024x768, 50 @800x600, 70 @640x480, 200 @320x240, 300 @160x120, 450 @64x64, 600 @32x32 | fps |
| Sub Resolutions | 1024x768, 800x600, 640x480, 320x240, 160x120, 64x64, 32x32 | |
| Shutter Speed (Exposure time) | 0.04~750 | ms |
| Hardware Gains (0x – 16x) | 12 | dB |
| Trigger Mode | With external trigger | |
| Lens mount | C-Mount, CS-Mount or custom-defined | |
| Built-in Filters | None | |
| Power consumption | < 1.0 | W |
| Dimension | 58 x 58 x 34 (CS-mount), 58 x 58 x 39 (C-mount) | mm |
| Weight (excluding lens) | 150 | g |

## Windowless USB2.0 Buffered CMOS Monochrome 1.3MP Cameras (10-bit )



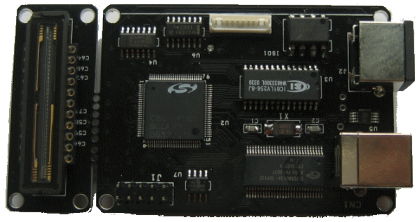
Mightex USB 2.0 monochrome cameras are designed for a wide variety of applications such as digital microscopy and medical imaging, where quality, ease of use, and cost-effectiveness are crucial. Monochrome cameras often exhibit 20% higher spatial resolution than their color counterparts because no pixel interpolation is necessary. Without a Bayer color filter on the sensor, monochrome cameras are also more sensitive than color sensors especially in near IR and UV regions. Frame rate can be as high as 12 fps in full resolution and up to 150 fps using ROI mode. A user-friendly GUI based application software and an SDK are provided for custom software development. In addition, a TWAIN driver, a DirectShow driver and a LabVIEW driver are also provided to easily link the cameras with users' applications. A USB command set protocol and a Linux driver are also provided for non-windows based applications. Window-less cameras are particularly useful for applications that are sensitive to multiple reflections due to the existence of the glass window in front of the CMOS sensor.

### PERFORMANCE SPECIFICATIONS

| Parameters | BTE-B013-UW and BTE-B013-UWS | Unit |
|---|---|---|
| Board-level/enclosed | Enclosed | |
| Number of GPIOs | 4 | |
| Resolution | 1280x1024 monochrome | |
| CMOS Chip | ½" (5:4) Aptina MT9M001 | |
| Pixel Size | 5.2 x 5.2 | μm |
| Active Imager Size | 6.66 x 5.32 | mm |
| Scanning System | Progressive | |
| Dynamic Range | 68 | dB |
| Sensor SNR | 45 | dB |
| Gray Level | 10 | bit |
| Responsivity | 2.1 | V/lux-sec |
| On-board Memory ("Frame Buffers") | 32 | MB |
| Frame Rates (@48MHz Clock) | 12 @1280x1024, 18 @1024x768, 25 @800x600, 28 @752x480, 33 @640x480, 70 @320x240 | fps |
| Sub Resolutions | Support arbitrary ROI, (X, Y) with X and Y multiples of 4 | |
| Shutter Speed (Exposure time) | 0.04~750 | ms |
| Hardware Gains | 0.125x ~ 8x | |
| Trigger Mode | With external trigger | |
| Lens mount | C-Mount, CS-Mount or custom-defined | |
| Built-in Filters | None | |
| Power consumption | < 1.8 | W |
| Dimension | 58 x 58 x 34 (CS-mount)<br>58 x 58 x 39 (C-mount) | mm |
| Weight (excluding lens) | 150 | g |

## 3648 Pixel 16-bit CCD Line Camera with External Trigger (Board-Level)

Mightex's TCN-1304-U line camera is a cost-effective high-performance B/W board-level line camera, based on a single-line, 3648-pixel CCD chip with USB2.0 (480 Mb/s) interface. CCD line cameras have several advantages over their area-array counterparts, including high optical linear resolution that allows systems developers to use the cameras to capture two-dimensional (2-D) images by moving the object or the CCD perpendicularly to the scan line. The TCN-1304-U is a compact, board-level line-scan camera ideal for a variety of OEM applications in industry process control, optical spectroscopy and bio-medical imaging etc. Setting up the TCN-1304-U line camera is very easy, the user simply installs the latest version of the operating software onto any desktop or notebook PC and then connects the USB cable from the line camera to the PC. There is no need for installing a DAC card, or using an external power supply. A user-friendly GUI based application software, LabVIEW support and an SDK are provided. In addition a USB command set protocol and a Linux driver are available for non-Windows based applications.



"Optimized for optical spectrometers"

### PERFORMANCE SPECIFICATIONS

| Parameters | TCN-1304-U | Unit |
|---|---|---|
| Board-level/enclosed | Board-level | |
| CCD chip | Toshiba TCD1304DG | |
| Number of pixels | 3648 | pixels |
| Pixel size | 8 x 200 | μm |
| Spectral range | 350 ~1000 | nm |
| Pixel output clock | 0.5 | MHz |
| Data storage on camera | 4 | frames |
| ADC resolution | 16 | bits |
| External trigger | Yes | |
| Exposure time range | 0.1 ~ 6,500 | ms |
| Number of GPIOs | 4 programmable I/O's | |
| Frame rate | 138 | scans/second |
| Host interface | USB2.0 | |

| SDK Features | |
|---|---|
| Operation Systems | Windows 2000, XP, Vista and Windows 7 |
| Minimum Requirement | RAM > 64M, hard disk space used > 10M |
| USB Port | 2.0 |
| Multiple Cameras | Supported |
| Device Driver | Yes |
| Demo Application | Yes |
| Library Files | Yes (DLL files and static library file) |
| Example Codes | Yes (VC++ and Delphi) |
| Frame Attributes | Exposure Time, Time Stamp, Trigger Event Count, Over-Exposure Detection. |

## 3648 Pixel 16-bit CCD Line Camera with External Trigger (Enclosed)

Mightex's TCE-1304-U line camera is a cost-effective high-performance B/W enclosed line camera, based on a single-line, 3648-pixel CCD chip with USB2.0 (480 Mb/s) interface. CCD line cameras have several advantages over their area-array counterparts, including high optical linear resolution that allows systems developers to use the cameras to capture two-dimensional (2-D) images by moving the object or the CCD perpendicularly to the scan line. TCE-1304-U is a compact line-scan camera ideal for a variety of OEM applications such as industry process control, optical spectroscopy and bio-medical imaging etc. A **windowless** version TCE-1304-UW is available which has a broader spectral response of 200 ~ 1000. Setting up the TCE-1304-U line camera is very easy: one simply needs to install the camera's application software into any PC, and then connect the line camera to the PC using a USB cable. There is no need to install a DAC card or to use an external power supply. A user-friendly GUI based application software, LabVIEW support and an SDK are provided. In addition a USB command set protocol and a Linux driver are available for non-Windows based applications.


### PERFORMANCE SPECIFICATIONS

| Parameters | TCE-1304-U and TCE-1304-UW | Unit |
|---|---|---|
| Board-level/enclosed | Enclosed | |
| CCD chip | Toshiba TCD1304DG | |
| Number of pixels | 3648 | pixels |
| Pixel size | 8 x 200 | μm |
| Spectral range | **TCE-1304-U**: 350 ~1000<br>**TCE-1304-UW**: 200 ~ 1000 | nm<br>nm |
| Pixel output clock | 0.5 | MHz |
| Data storage on camera | 4 | frames |
| ADC resolution | 16 | bits |
| External trigger | Yes | |
| Exposure time range | 0.1 ~ 6,500 | ms |
| Number of GPIOs | 4 programmable I/O's | |
| Frame rate | 138 | scans/second |
| Dimensions (Length x Width x Height) | 78 x 42 x 57 | mm |
| Weight | 200 | g |

| SDK Features | |
|---|---|
| Operation systems | Windows 2000, XP, Vista and Windows 7 |
| Minimum requirement | RAM > 64M, Hard Disk Space Used > 10M |
| USB port | 2.0 |
| Multiple cameras | Supported |
| Device driver | Yes |
| Demo application | Yes |
| Library files | Yes (DLL files and static library file) |
| Example codes | Yes (VC++, CSharp, Visual Basic and Delphi) |
| Frame Attributes* | Exposure Time, Time Stamp, Trigger Event Count, Over-Exposure Detection. |

## High-Speed 2048-Pixel 12-bit CCD Line Camera with External Trigger

Mightex's TCN/TCE-1209-U line camera is a cost-effective high-performance monochrome line CCD camera, based on a single-line, 2048-pixel CCD chip with USB2.0 (480 Mb/s) interface. CCD line cameras have several advantages over their area-array counterparts, including high optical linear resolution that allows systems developers to use the cameras to capture two-dimensional (2-D) images by moving the object or the CCD perpendicularly to the scan line. The TCN/TCE-1209-U is a compact linear camera ideal for a variety of OEM applications in industry process control, optics, biology, spectroscopy and re-flection imaging. Setting up the TCN/TCE-1209-U line camera is very easy: the user simply installs the application software (included in the shipping pack-age) and then connects the line camera to the PC using a USB cable. There is no need to install a DAC card, and no external power supply is required.

### PERFORMANCE SPECIFICATIONS

| Parameter | TCN-1209-U or TCE-1209-U |
|---|---|
| CCD | Toshiba TCD1209 |
| Number of Pixels | 2048 |
| Pixel Size | 14μm x 14μm |
| Spectral range | 350~1000nm |
| Pixel Output Clock | 8 MHz |
| Frame buffers on camera | 64 frames |
| ADC resolution | 12 bits |
| External Trigger | Yes |
| Exposure Time Range | 0.3 ~ 3,277ms |
| GPIO | Yes (4 programmable I/Os) |
| Frame Rate | 3,300 scans/second* |
| Lens mount (optional) | F mount |
| Host Interface | USB 2.0 |

| SDK Features | |
|---|---|
| Operation Systems | Windows 2000, XP, Vista, Windows 7 |
| Minimum Requirement | RAM > 64M; Available Hard Disk Space > 10M |
| USB Port | USB2.0 |
| Multiple Cameras | Supported |
| Plug & Play | Not recommended |
| Device Driver | Yes |
| Demo Application | Yes |
| Library Files | Yes (DLL files and Static Library file) |
| Example Codes | Yes (VC++ and Delphi) |
| Frame Attributes | Exposure Time, Time Stamp, Trigger Event Count, Over Exposure Detect. |

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# Table of Content

## Manual & Analog-Input Controlled Universal LED Controller with Current Display

Mightex's SLB-1200-1 universal LED driver is designed for driving a broad range of LED light sources. The LED driver has two operational modes:

1) **Manual Knob Control Mode:** the output current can be adjusted manually;
2) **Analog Input Control Mode**: the output current can be controlled via a 0~5V analog input signal.

The control mode is set via a DIP switch, and the factory default setting is "Manual Knob Control Mode". The driver also has a Maximum Current Setting DIP Switch, which allows user to set the maximum current to 350mA, 750mA or 1200mA, whichever applicable. The factory default sBetting is 350mA. When the Maximum Current Setting DIP Switch is set at a smaller value (e.g. 350mA), the LED driver has a finer resolution for the output current.
When the driver is set to "Analog Input Control Mode", the output current is proportional to the voltage of the analog input signal.

### ELECTRICAL SPECIFICATION

| Parameters | SLA-1200-1 | Unit |
|---|---|---|
| Number of Channels | 1 | |
| Power Supply Input Voltage ($V_{dc}$) | 9 ~ 24 | V |
| Maximum Output Voltage ($V_{max}$) | $V_{dc}$ - 3.0 | V |
| Maximum Per Channel Output Current ($I_{max}$)* | 1200 | mA |
| Maximum Per Channel Output Power ($P_{max}$)** | 10 | W |

* The maximum output current can be set to 1200, 750 or 350 mA using the DIP switch.

** If the channel output voltage is $V_d$ and the output current is $I_d$, they must simultaneously satisfy the following conditions: (1) $V_d <= V_{max}$ ; (2) $I_d <= I_{max}$; and (3) $V_d * I_d <= P_{max}$.

### CHANNEL I/O PIN DEFINITION

Each channel has four pins, defined as follows:

| Pin Label | LED+ | LED- | Analog Signal | Analog Input GND |
|---|---|---|---|---|
| Description | LED Anode | LED Cathode | 0~5V Analog Input | Analog Input Ground |

## Manual and Analog-Input Controlled Universal 2-Channel LED Controllers

Mightex's SLA-series 2- channel universal LED controllers are designed to drive a broad range of LED light sources. These LED drivers have two operational modes:

1) **Manual Knob Control Mode**: the current output of each channel can be adjusted manually;
2) **Analog Input Control Mode**: the current output of each channel can be controlled via 0 ~ 5V analog input


The control mode is set via a DIP switch, and the factory default setting is "Manual Knob Control Mode". The drivers also have a Maximum Current Setting DIP Switch, which allows user to set the maximum current to 350mA, 750mA or 1200mA, whichever applicable. The factory default setting is 350mA. When the Maximum Current Setting DIP Switch is set at a smaller value (e.g. 350mA), the LED driver has a finer resolution for the output current. When the driver is set to "Analog Input Control Mode", the output current is proportional to the voltage of the analog input signal. For the 2-channel models, the operational mode and the current limit of each channel can be set independently from each other.

### ELECTRICAL SPECIFICATION

| Parameters | SLA-0350-2 | SLA-0750-2 | SLA-1200-2 | Unit |
|---|---|---|---|---|
| Number of Channels | 2 | 2 | 2 | |
| Power Supply Input Voltage ($V_{dc}$) | 9 ~ 24 | 9 ~ 24 | 9 ~ 24 | V |
| Maximum Output Voltage ($V_{max}$) [1] | <21 | <21 | <21 | V |
| Maximum Per Channel Output Current ($I_{max}$) [2] | 350 | 750 | 1200 | mA |
| Maximum Per Channel Output Power ($P_{max}$) [3] | 10 | 10 | 10 | W |

1. Maximum Output Voltage is 3V less than the Power Supply Input Voltage, i.e. $V_{max} = V_{dc}$ -3V. For instance, with a Power Supply Input Voltage of $V_{dc}$=24V, the Maximum Output Voltage $V_{max}$ would be ($V_{dc}$-3V)=21V; and

2. If the channel output voltage is $V_d$ and the output current is $I_d$, they must simultaneously satisfy: (1) $V_d <= V_{max}$ ; (2) $I_d <= I_{max}$; and (3) Vd * Id <= $P_{max}$.

3. If the channel output voltage is Vd and the output current is Id, they must simultaneously satisfy: (1) Vd <= Vmax ; (2) Id <= Imax; and (3) Vd * Id <= Pmax.

### CHANNEL I/O PIN DEFINITION

Each channel has four pins, defined as follows:

| Pin Label | LED+ | LED- | Analog Signal | Analog Input GND |
|---|---|---|---|---|
| Description | LED Anode | LED Cathode | 0~5V Analog Input | Analog Input Ground |

## Compact Universal 1- and 2- Channel LED Controllers


Mightex's Compact 1- and 2- Channel Computer-Controlled Universal LED Drivers are designed to drive a broad range of LED light sources. Each unit comes with a powerful PC-based software with a user-friendly GUI, which enables users to drive LEDs without the need to write any code. In addition, a full-featured SDK is provided, in order for users to write their own software and to integrate Mightex's LED drivers into their own systems. Furthermore, the drivers have a built-in protection feature, allowing users to limit LED driving current and voltage.

Each channel can be individually configured to work under one of the following two modes:

1) **Normal Mode (or DC Mode)**: The output current is a constant, which can be adjusted (using software) from 0 mA to 1,000 mA, through the USB interface;

**2) Strobe Mode**: A Pulse-Width-Modulated (or PWM) periodic strobe pattern is output from the channel, which can be turned on by a software trigger. The strobe pattern may last indefinitely or for a preset number of cycles. The frequency of the PWM strobe can be up to 500Hz

In addition, each channel can be individually **DISABLED** and **ENABLED**. No voltage or current is output from a DISABLED channel.

### ELECTRICAL SPECIFICATION

| Parameters | SLC-MA01-U | SLC-MA02-U | Unit |
|---|---|---|---|
| Number of Channels | 1 | 2 | |
| Power Supply Input Voltage ($V_{dc}$) | 9 ~ 24 | | V |
| Maximum Output Voltage ($V_{max}$) [1] | <21 | | V |
| Maximum Per Channel Output Current ($I_{max}$) | 1,000 | | mA |
| Maximum Per Channel Output Power ($P_{max}$) [2] | 10 | | W |
| Output Current Resolution | 1 | | mA |
| Output Current Accuracy | ±5 mA or ±1.0%, whichever is larger | | mA |
| Output Current Repeatability | ±2 mA or ±0.5%, whichever is larger | | mA |
| PWM Timing Resolution [3] | 100 | | ms |
| PWM Timing Minimum Step Size [3] | 1,000 | | ms |
| Interface | USB | | |

1. Maximum Output Voltage is 3V less than the Power Supply Input Voltage, i.e. $V_{max} = V_{dc} - 3V$. For instance, with a Power Supply Input Voltage of $V_{dc}$=24V, the Maximum Output Voltage $V_{max}$ would be ($V_{dc}$-3V)=21V;
2. If the channel output voltage is $V_d$ and the output current is $I_d$, they must simultaneously satisfy: (1) $V_d <= V_{max}$ ; (2) $I_d <= I_{max}$; and (3) Vd * Id <= $P_{max}$; and
3. Each period of a PWM square wave comprises of ON time and OFF time, i.e. two (2) 'steps'. The minimum value for each step is 1000ms, and the minimum increment is 100ms.

### CHANNEL I/O PIN DEFINITION

Each Channel has two pins, defined as following:

| Label | LED+ | LED- |
|---|---|---|
| Description | LED Anode | LED Cathode |

## Universal 2- and 4-Channel LED Controllers with External Triggers

Mightex has developed a series of computer-controllable, multi-channel, universal LED controllers, which can be used to drive any type of LED in any of the three (3) modes: 'NORMAL' (or 'constant current'), 'STROBE', and/or external 'TRIGGER' mode. Each unit comes with PC-based software with a user-friendly GUI, which enables users to drive LEDs without the need to write any code. In addition, a powerful SDK is provided, in order for users to write their own software and to integrate Mightex's LED drivers into their own systems. Furthermore, the drivers have a built-in security feature, allowing users to limit LED driving current and voltage.


### ELECTRICAL SPECIFICATION

| Parameters | SLC-AA02-US<br>SLC-AA04-US | SLC-AV02-US<br>SLC-AV04-US | SLC-SA02-US<br>SLC-SA04-US | SLC-SV02-US<br>SLC-SV04-US | Unit |
|---|---|---|---|---|---|
| Power Supply Input Voltage, V(dc) | 9 ~ 24 | | | | V |
| Power Supply Input Current | < 4000 | | | | mA |
| Per Channel Driving Voltage (max) | 11.5V (with a 12V DC input) or 23.5V (with a 24V DC input) | | | | V |
| Per Channel Driving Current | 0 ~ 1000 ("NORMAL" MODE) | | | | mA |
| | 0 ~ 3500 ("STROBE" or "TRIGGER" MODE) | | | | mA |
| Output Current Resolution | 1 | | | | mA |
| Output Current Linearity | +/-4 (or +/-0.5%) | | | | mA |
| Output Current Repeatability | +/-1 (or +/-0.2%) | | | | mA |
| Trigger Input High Level | 4.5 ~ 10.0 | | | | V |
| Trigger Input Low Level | 0.8 (Max.) | | | | V |
| Forward Voltage Monitoring Capability | No | Yes | No | Yes | - |
| Forward Voltage Monitoring Accuracy | N.A. | +/-10 | N.A. | +/-10 | mV |

### TIMING SPECIFICATION:

| Parameters | SLC-AA02-US<br>SLC-AA04-US | SLC-AV02-US<br>SLC-AV04-US | SLC-SA02-US<br>SLC-SA04-US | SLC-SV02-US<br>SLC-SV04-US | Unit |
|---|---|---|---|---|---|
| Timing Resolution | 20 | | | | µs |
| # of Data Points for Waveform Definition | 128 | | 2 | | - |
| Trigger Pulse Width | 100 (Minimum) | | | | µs |
| Max Trigger Delay | 25 | | | | µs |

## High-Precision Universal 2- and 4-Channel LED Controllers with External Triggers

Mightex has developed a series of computer-controllable, multi-channel, universal LED controllers, which can be used to drive any type of LED in any of the three (3) modes: 'NORMAL' (or 'constant current'), 'STROBE', and/or external 'TRIGGER' mode. Each unit comes with PC-based software with a user-friendly GUI, which enables users to drive LEDs without the need to write any code. In addition, a powerful SDK is provided, in order for users to write their own software and to integrate Mightex's LED drivers into their own systems. Furthermore, the drivers have a built-in security feature, allowing users to limit LED driving current and voltage.


### ELECTRICAL SPECIFICATION

| Parameters | SLC-FA02-US SLC-FA04-US | SLC-FV02-US SLC-FV04-US | SLC-XA02-US SLC-XA04-US | SLC-XV02-US SLC-XV04-US | Unit |
|---|---|---|---|---|---|
| Power Supply Input Voltage, V(dc) | 9 ~ 24 | | | | V |
| Power Supply Input Current | < 4000 | | | | mA |
| Per Channel Driving Voltage (max) | 11.5V (with a 12V DC input) or 23.5V (with a 24V DC input) | | | | V |
| Per Channel Driving Current | 0 ~ 100 ("NORMAL" MODE) | | | | mA |
| | 0 ~ 350 ("STROBE" or "TRIGGER" MODE) | | | | mA |
| Output Current Resolution | 0.1 | | | | mA |
| Output Current Linearity | +/-4 (or +/-0.5%) | | | | mA |
| Output Current Repeatability | +/-1 (or +/-0.2%) | | | | mA |
| Trigger Input High Level | 4.5 ~ 10.0 | | | | V |
| Trigger Input Low Level | 0.8 (Max.) | | | | V |
| Forward Voltage Monitoring Capability | No | Yes | No | Yes | - |
| Forward Voltage Monitoring Accuracy | N.A. | +/-10 | N.A. | +/-10 | mV |

### TIMING SPECIFICATION:

| Parameters | SLC-FA02-US SLC-FA04-US | SLC-FV02-US SLC-FV04-US | SLC-XA02-US SLC-XA04-US | SLC-XV02-US SLC-XV04-US | Unit |
|---|---|---|---|---|---|
| Timing Resolution | 20 | | | | µs |
| # of Data Points for Waveform Definition | 2 | | 128 | | - |
| Trigger Pulse Width | 100 (Minimum) | | | | µs |
| Max Trigger Delay | 25 | | | | µs |

## High-Current Universal 2-Channel LED Controllers with External Triggers

Mightex has developed a series of computer-controllable, multi-channel, universal LED controllers, which can be used to drive any type of LED in any of the three (3) modes: 'NORMAL' (or 'constant current'), 'STROBE', and/or external 'TRIGGER' mode. Each unit comes with PC-based software with a user-friendly GUI, which enables users to drive LEDs without the need to write any code. In addition, a powerful SDK is provided, in order for users to write their own software and to integrate Mightex's LED drivers into their own systems. Furthermore, the drivers have a built-in security feature, allowing users to limit LED driving current and voltage.


### ELECTRICAL SPECIFICATION

| Parameters | SLC-HA02-US | SLC-HV02-US | Unit |
|---|---|---|---|
| Power Supply Input Voltage, V(dc) | 9 ~ 12 | | V |
| Power Supply Input Current | 4,000 | | mA |
| Per Channel Driving Voltage (max) | Up to 11.5 | | V |
| Maximum Per Channel Driving Current | 2,000 ("NORMAL" MODE) | | mA |
| | 3,500 ("STROBE" or "TRIGGER" MODE) | | mA |
| Output Current Resolution | 1 | | mA |
| Output Current Linearity | +/-4 (or +/-0.5%) | | mA |
| Output Current Repeatability | +/-1 (or +/-0.2%) | | mA |
| Trigger Input High Level | 3.3 ~ 10.0 | | V |
| Trigger Input Low Level | 0.8 (Max.) | | V |
| Forward Voltage Monitoring Accuracy | N/A | +/-10 | mV |

### TIMING SPECIFICATION:

| Parameters | SLC-HA02-US | SLC-HV02-US | Unit |
|---|---|---|---|
| Timing Resolution | 20 | | µs |
| # of Data Points for Waveform Defini- | 2 | | |
| Trigger Pulse Width | 100 (Minimum) | | µs |
| Max Trigger Delay | 25 | | µs |

## Universal 12- and 16- Channel LED Controllers


Mightex's 12- and 16- Channel Computer-Controlled Universal LED Drivers are designed to drive a broad range of LED light sources. Each unit comes with a powerful PC-based software with a user-friendly GUI, which enables users to drive LEDs without the need to write any code. In addition, a full-featured SDK is provided, in order for users to write their own software and to integrate Mightex's LED drivers into their own systems. Furthermore, the drivers have a built-in protection feature, allowing users to limit LED driving current and voltage.

Each channel can be individually configured to work under one of the following two modes:

**Normal Mode (or DC Mode)**: The output current is a constant, which can be adjusted (using software) from 0 mA to 1,000 mA, through the USB interface;

**Strobe Mode**: A Pulse-Width-Modulated (or PWM) periodic strobe pattern is output from the channel, which can be turned on by a software trigger. The strobe pattern may last indefinitely or for a preset number of cycles. The frequency of

In addition, each channel can be individually **DISABLED** and **ENABLED**. No voltage or current is output from a DISABLED channel.

### ELECTRICAL SPECIFICATION

| **Parameters** | **SLC-CA12-U SLC-CA12-S** | **SLC-CA16-U SLC-CA16-S** | **SLC-MA12-U SLC-MA12-S** | **SLC-MA16-U SLC-MA16-S** | **Unit** |
|---|---|---|---|---|---|
| Number of Channels | 12 | 16 | 12 | 16 | |
| Power Supply Input Voltage ($V_{dc}$) | 9 ~ 24 | | 9 ~ 24 | | V |
| Maximum Output Voltage ($V_{max}$) [1] | <21 | | <21 | | V |
| Maximum Per Channel Output Current ($I_{max}$) | 1,000 | | 1,000 | | mA |
| Maximum Per Channel Output Power ($P_{max}$) [2] | 10 | | 10 | | W |
| Output Current Resolution | 5 | | 1 | | mA |
| Output Current Accuracy | ±10 mA or ±2.0%, whichever is larger | | ±5 mA or ±1.0%, whichever is larger | | mA |
| Output Current Repeatability | ±5 mA or ±1%, whichever is larger | | ±2 mA or ±0.5%, whichever is larger | | mA |
| PWM Timing Resolution [3] | 100 | | 100 | | µs |
| PWM Timing Minimum Step Size [3] | 1,000 | | 1,000 | | µs |
| Interface | USB (-U) or RS232 (-S) | | | | |

1. Maximum Output Voltage is 3V less than the Power Supply Input Voltage, i.e. $V_{max} = V_{dc} - 3V$. For instance, with a Power Supply Input Voltage of $V_{dc}$=24V, the Maximum Output Voltage $V_{max}$ would be ($V_{dc}$-3V)=21V;
2. If the channel output voltage is $V_d$ and the output current is $I_d$, they must simultaneously satisfy: (1) $V_d <= V_{max}$ ; (2) $I_d <= I_{max}$; and (3) Vd * Id <= $P_{max}$; and
3. Each period of a PWM square wave comprises of ON time and OFF time, i.e. two (2) 'steps'. The minimum value for each step is 1000ms, and the minimum increment is 100ms.

### CHANNEL I/O PIN DEFINITION

Each channel has two pins, defined as following:

| **Label** | LED+ | LED- |
|---|---|---|
| **Description** | LED Anode | LED Cathode |

## High-Current Dual-Mode (Manual/Software) LED Controller

Mightex's SLB-HA01-U LED controller is a constant-current source, and it is designed as a universal LED controller capable of driving a broad range of LED's. The device has two control modes:

- **Software Control Mode**: The device can be controlled via USB interface by software on a host (e.g. a PC).
- **Manual Control Mode**: When the device is set to NORMAL mode, the device can be manually controlled via a knob and three buttons on its front panel.


The SLB-HA01-U LED controller has one (1) output channel. It has a USB interface through which the device can be controlled by a host (e.g. a PC). In addition, it also has a turning knob, three buttons, and a 2x16 LCD display on its front panel, through which user can control the output current manually. In addition, one can set the maximum output current (Imax), manually or by software, and then adjust the actual output current ranging from 0 to Imax via the knob or via software.

### ELECTRICAL SPECIFICATION

| Parameters | SLB-HA01-U | Unit |
|---|---|---|
| Power Supply Input Voltage, | 9 ~ 24 | V(dc) |
| Max Output Voltage | V(dc) - 1.0 | V |
| Channel Driving Current | 0~2000 (in CW mode) | mA |
| | 0~3500 (in Strobe/Trigger mode) | mA |
| Current Resolution | 1 (in 0~3500mA range) | mA |
| Current Accuracy | +/-4 or +/-0.5% (whichever is larger) | mA |
| Current Repeatability | +/-1 or +/-0.2% (whichever is larger) | mA |
| Trigger Input High Level | 4.5~10.0 | V |
| Trigger Input Low Level 0~0.8 V | 0~0.8 | V |

### CHANNEL I/O PIN DEFINITION:

The channel has four pins as follows:

| Pin Label | LED + | LED - | Trigger + | Trigger - |
|---|---|---|---|---|
| Description | LED Anode | LED Cathode | External Trigger + | External Trigger - |

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## High Power Fiber-Coupled LED Light Sources (UV, VIS and NIR)

Mightex FCS-series fiber-coupled LED light sources employ the latest high-power LED technologies and a proprietary coupling optics to achieve maximum optical output power. Optical output is coupled into a fiber through a standard SMA fiber adaptor port (SMA fiber patch cords are sold separately). FCS series also features a locking electrical connector for secured connection. FCS series are designed as a universal light source for general lab use and OEM applications. The one-piece machined housing features multiple mounting holes. All Mightex LED drivers such as the SLC series or other LED drivers and current sources can be used to drive the light sources.

Fiber Patch Cord Not Included

### PERFORMANCE SPECIFICATIONS

| Wavelength Code | Description | Peak Wavelength (nm) | $I_{op}$ (mA) | $V_{op}$ (V) | Radiant Flux[1] (mW) |
|---|---|---|---|---|---|
| 0000 | Cool White | 5500K | 1000 | 3.9 | 3.2 |
| 0001 | Warm White | 3400K | 1000 | 3.9 | 3.2 |
| 0365 | UV 365nm | 365 | 500 | 3.8 | 3.1 |
| 0385 | UV 385nm | 385 | 500 | 3.8 | 3.4 |
| 0400 | UV 400nm | 400 | 350 | 3.5 | 0.8 |
| 0455 | Royal Blue | 455 | 1000 | 3.9 | 5.6 |
| 0470 | Blue | 470 | 1000 | 3.9 | 4.3 |
| 0505 | Cyan | 505 | 1000 | 3.9 | 1.0 |
| 0530 | Green | 530 | 1000 | 3.9 | 2.0 |
| 0590 | Amber | 590 | 1000 | 3.2 | 1.2 |
| 0617 | Red-Orange | 617 | 1000 | 3.0 | 6.5 |
| 0625 | Red | 625 | 1000 | 3.0 | 6.5 |
| 0657 | Deep Red | 657 | 350 | 2.4 | 1.0 |
| 0740 | NIR | 740 | 350 | 2.1 | 1.5 |
| 0850 | NIR | 850 | 1000 | 2.1 | 4.0 |
| 0940 | NIR | 940 | 1000 | 2.4 | 4.0 |

Note: * - With 400μm-core 0.22 numerical aperture (NA) fiber. Output optical power scales approximately linearly with fiber core area and $NA^2$.

## High Power Light-Guide Coupled LED Light Sources (UV, VIS and NIR)

Mightex GCS-series high-power LED sources are designed for high-efficiency coupling of LED light into a liquid light guide (LLG) or a fiber optic bundle. Virtually all light guides with core diameter ranging from 3mm to 8mm can be used with the GCS-series light source. Please note that light guides and adapters are sold separately. GCS series also features a locking electrical connector for secured connection. GCS series are designed as a universal light source for general lab use and OEM applications. All Mightex's LED drivers such as the SLC series or other LED drivers and current sources can be used to drive the GCS-series light sources. The one-piece machined aluminum alloy housing features integrated heatsinks and multiple mounting holes.


Note: Liquid light guide not included.

### PERFORMANCE SPECIFICATIONS

| Wavelength Code | Description | Peak Wavelength (nm) | $I_{op}$ (mA) | $V_{op}$ (V) | Radiant Flux[1] (mW) |
|---|---|---|---|---|---|
| 0000 | Cool White | 5500K | 1000 | 3.9 | 95 |
| 0001 | Warm White | 3400K | 1000 | 3.9 | 95 |
| 0365 | UV 365nm | 365 | 500 | 3.8 | 90 |
| 0385 | UV 385nm | 385 | 500 | 3.8 | 100 |
| 0455 | Royal Blue | 455 | 1000 | 3.9 | 165 |
| 0470 | Blue | 470 | 1000 | 3.9 | 130 |
| 0505 | Cyan | 505 | 1000 | 3.9 | 30 |
| 0530 | Green | 530 | 1000 | 3.9 | 60 |
| 0590 | Amber | 590 | 1000 | 3.2 | 35 |
| 0617 | Red-Orange | 617 | 1000 | 3.0 | 200 |
| 0625 | Red | 625 | 1000 | 3.0 | 200 |
| 0850 | NIR | 850 | 1000 | 2.1 | 125 |
| 0940 | NIR | 940 | 1000 | 2.4 | 125 |

Note: 1 - Measured at exiting end of a 3mm-core 0.59 numerical aperture (NA) liquid light guide.

## High Power LED Collimator Sources

A LED collimator consists of a collimating lens and a LED emitter. The LED emitter is placed at the focal plane of the collimating lens which images the LED emitter into infinity. Mightex LED collimators employ a high-NA aspherical collimating lens for precision collimation and high light throughput.

LED collimators can be used as the light source in an illumination system. For example LED collimators can replace the standard lamp assembly in a microscope to provide stable, intense, and fast-modulated illumination. Typically the rest of the illumination optics will image the LED emitter onto the pupil of the imaging optics where as the lens aperture on the collimator where intensity is uniform will be projected onto the object. In other illumination applications similar arrangement should be made to produce uniform and efficient illumination.

The LED emitters are mounted directly onto the metal base of the collimator which also features an integrated heat sink. This configuration minimizes thermal resistance between the LED emitter and the heat sink resulting in better heat dissipation. The collimating lens can be adjusted if needed for precise collimation. A locking ring fixes the lens position after adjustment. The collimators have been pre-adjusted in the factory.

The LED collimators include a 1-meter cable with two bare-wire terminals at the end. The light sources can be driven by Mightex LED controllers or other LED controllers and current sources. An optional focusing module can be mounted on the front of the LED collimator to focus light into a tight spot which is an image of the LED emitter. One of the applications with the focusing module is coupling LED light into a fiber or a light guide.

### PERFORMANCE SPECIFICATIONS

| Part Number | Wavelength | Diverging Angle (deg.) | $I_{op}$ (mA) | $V_{op}$ (V) | Output Power (mW) |
|---|---|---|---|---|---|
| LCS-0365-02-22 | 365 | +/-1.7 | 500 | 3.8 | 80 |
| LCS-0385-02-22 | 385 | +/-1.7 | 500 | 3.8 | 100 |
| LCS-0400-01-22 | 400 | +/-2.5 | 350 | 3.5 | 100 |
| LCS-0455-03-22 | 455 | +/-1.7 | 1000 | 3.9 | 280 |
| LCS-0455-05-22 | 455 | +/-5.0 | 700 | 6.8 | 350 |
| LCS-0470-03-22 | 470 | +/-1.7 | 1000 | 3.9 | 200 |
| LCS-0470-05-22 | 470 | +/-5.0 | 700 | 6.8 | 250 |
| LCS-0505-03-22 | 505 | +/-1.7 | 1000 | 3.9 | 135 |
| LCS-0505-05-22 | 505 | +/-5.0 | 700 | 6.8 | 170 |
| LCS-0530-03-22 | 530 | +/-1.7 | 1000 | 3.9 | 100 |
| LCS-0530-05-22 | 530 | +/-5.0 | 700 | 6.8 | 125 |
| LCS-0590-03-22 | 590 | +/-1.7 | 1000 | 3.9 | 65 |
| LCS-0617-03-22 | 617 | +/-1.7 | 1000 | 3.9 | 280 |
| LCS-0625-03-22 | 625 | +/-1.7 | 1000 | 3.9 | 280 |
| LCS-0657-01-22 | 657 | +/-2.5 | 350 | 2.4 | 100 |
| LCS-0740-01-22 | 740 | +/-2.5 | 350 | 2.2 | 65 |
| LCS-0850-02-22 | 850 | +/-2.5 | 1000 | 2.1 | 175 |
| LCS-0940-01-22 | 940 | +/-1.7 | 700 | 1.5 | 100 |
| LCS-5500-03-22 | cool white 5500K | +/-1.7 | 1000 | 3.9 | 170 |
| LCS-4000-03-22 | warm white 4000K | +/-1.7 | 1000 | 3.9 | 180 |

## Low-Cost LED Spot Lights

High-power LEDs are a new class of light sources that have numerous applications in industry, consumer, medical, and scientific fields. However, engineers and scientists often find that they have to design and fabricate heat sinks and optical mounts, and solder electrical contacts before they can light up a high-power LED. Mightex provides ready-to-use high-power LED light sources with integrated heat sinks and mounted collecting optics. Sirius™ compact high-power light sources are designed as a universal light source for general lab use and OEM applications. The mechanical housing features multiple mounting holes compatible to common opto-mechanical mounts. Sirius™ light sources can be driven by Mightex's SLC-series multi-channel LED drivers or other LED drivers and

### PERFORMANCE SPECIFICATIONS

**Table 1. LED Emitter Specifications**

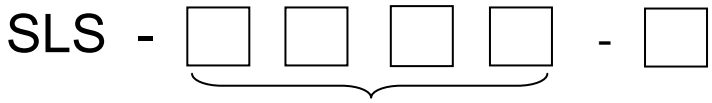
| LED Code | Description | Peak Wavelengt (nm) | $I_{op}$ (mA) | $V_{op}$ (V) | Luminous Flux (lm) |
|---|---|---|---|---|---|
| 0100 | 1W White LED | 5500K | 350 | 3.4 | 45 |
| 0109 | 1W UV | 395-410 | 350 | 3.5 | 180 mW |
| 0101 | 1W Royal Blue | 455 | 350 | 3.4 | 220 mW |
| 0102 | 1W Blue | 470 | 350 | 3.4 | 16 |
| 0103 | 1W Cyan | 505 | 350 | 3.4 | 45 |
| 0104 | 1W Green | 530 | 350 | 3.4 | 53 |
| 0105 | 1W Amber | 590 | 350 | 3.0 | 42 |
| 0106 | 1W Red-Orange | 617 | 350 | 3.0 | 55 |
| 0107 | 1W Red | 625 | 350 | 3.0 | 44 |
| 0110 | 1W Deep Red | 657 | 350 | 2.4 | 170mW |
| 0111 | 1W 740nm | 740 | 350 | 2.2 | 120mW |
| 0112 | 1W 940nm | 940 | 700 | 1.5 | 180mW |
| 0300 | 3W White LED | 5500K | 1000 | 3.9 | 80 |
| 0309 | 3W UV | 395-410 | 700 | 3.5 | 350 mW |
| 0301 | 3W Royal Blue | 455 | 1000 | 3.9 | 450 mW |
| 0302 | 3W Blue | 470 | 1000 | 3.9 | 30 |
| 0303 | 3W Cyan | 505 | 1000 | 3.9 | 80 |
| 0304 | 3W Green | 530 | 1000 | 3.9 | 80 |
| 0305 | 3W Amber | 590 | 1400 | 3.0 | 110 |
| 0306 | 3W Red-Orange | 617 | 1400 | 3.0 | 190 |
| 0307 | 3W Red | 625 | 1400 | 3.0 | 140 |
| 0208 | 2.4W Near Infrared | 850 | 1000 | 1.8~2.4 | 375 mW |
| 0501 | 5W Royal Blue | 455 | 1000 | 6.8 | 700 mW |
| 0502 | 5W Blue | 470 | 700 | 6.8 | 48 |
| 0503 | 5W Cyan | 505 | 1000 | 6.8 | 160 |
| 0504 | 5W Green | 530 | 1000 | 6.8 | 160 |

## Low-cost LED Spot Lights (Cont'd)

**Table 2. Collecting Optics Specifications**

| LENS Code | Description | Clear Aperture (mm) | X- Half Angle (degree) | Y- Half Angle (degree) | Efficiency (%) |
|---|---|---|---|---|---|
| A | Narrow Beam | 19 | 5 | 5 | 85 |
| B | Medium Beam | 19 | 15 | 15 | 85 |
| C | Wide Beam | 19 | 25 | 25 | 85 |
| D | Oval Beam | 19 | 5 | 20 | 85 |
| E[1] | Fiber Bundle Coupling | 19 | 7mm full field | 7mm full field | 85 |

**Part Number and Ordering Information**




**LED Code** **Lens Code**

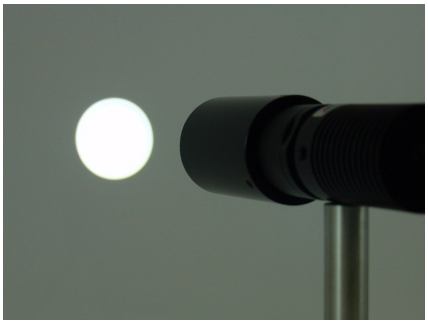
For example, SLS-0104-B is a light source with a 1W green emitter and 15-degree collecting optics.

With a world-class OEM design team, Mightex offers a broad range of customized solutions in order to meet individual customer's unique requirements. Please call 1-416-840 4991 or email

## Precision LED Spot Lights

Mightex precision LED spotlight consists of a state-of-the-art high-power LED emitter and a proprietary high-NA multi-element aspherical optical system. The result is a high-power, uniform illumination spot with a highly-delineated edge.

Mightex PLS- series precision LED spotlights are a general-purpose light source that can be used where uniform and high-intensity illumination is required. The projection lens at the front of the spotlight can be slid and locked to focus the illumination pattern at different working distances. With the standard projection lens spot diameter is linearly proportional to working distance.



The LED emitters are mounted directly on the metal base of the light source which also features an integrated heatsink. This configuration minimizes thermal resistance between the LED emitter and the heatsink resulting in better heat dissipation.

The precision LED spotlight includes a 2-meter cable with two bare-wire terminals at the end. The light sources can be driven by Mightex's LED controllers, or other LED controllers and current sources.

### PERFORMANCE SPECIFICATIONS

| Part Number | Wavelength (nm) | $I_{op}$ (mA) | $V_{op}$ (V) | Output Power (mW) |
|---|---|---|---|---|
| PLS-0365-030-S | 365 | 500 | 3.8 | 50 |
| PLS-0385-030-S | 385 | 500 | 3.8 | 50 |
| PLS-0400-030-S | 400 | 350 | 3.5 | 50 |
| PLS-0455-030-S | 455 | 1000 | 3.9 | 150 |
| PLS-0470-030-S | 470 | 1000 | 3.9 | 110 |
| PLS-0505-030-S | 505 | 1000 | 3.9 | 65 |
| PLS-0530-030-S | 530 | 1000 | 3.9 | 50 |
| PLS-0590-030-S | 590 | 1000 | 3.9 | 35 |
| PLS-0617-030-S | 617 | 1000 | 3.9 | 150 |
| PLS-0625-030-S | 625 | 1000 | 3.9 | 150 |
| PLS-0657-030-S | 657 | 350 | 2.4 | 50 |
| PLS-0740-030-S | 740 | 350 | 2.2 | 35 |
| PLS-0850-030-S | 850 | 1000 | 2.1 | 85 |
| PLS-0940-030-S | 940 | 700 | 1.5 | 50 |
| PLS-5500-030-S | cool white 5500K | 1000 | 3.9 | 85 |
| PLS-4000-030-S | warm white 4000K | 1000 | 3.9 | 85 |

## Spectrum Synthesizing Sources ("Cubic-S")

Many applications, such as microscopy, multi-spectral imaging, LCD display characterization, detector calibration, and color measurement etc., can benefit tremendously from a light source with an arbitrarily programmable optical spectrum. As apposed to conventional tunable lasers, which only produce a single wavelength at a time, Mightex Optical Spectrum Synthesizing Source ("Cubic-S") is capable of dynamically generating any custom-specified target spectrum across the entire spectral range.


### PRODUCT DESCRIPTION

As illustrated in Figure-1, Mightex Cubic-S is composed of the following modules: (1) An Optical Core Module; (2) A Controller Electronic Module; (3) An optional Spectrum Monitor; and (4) Control Software in the computer.

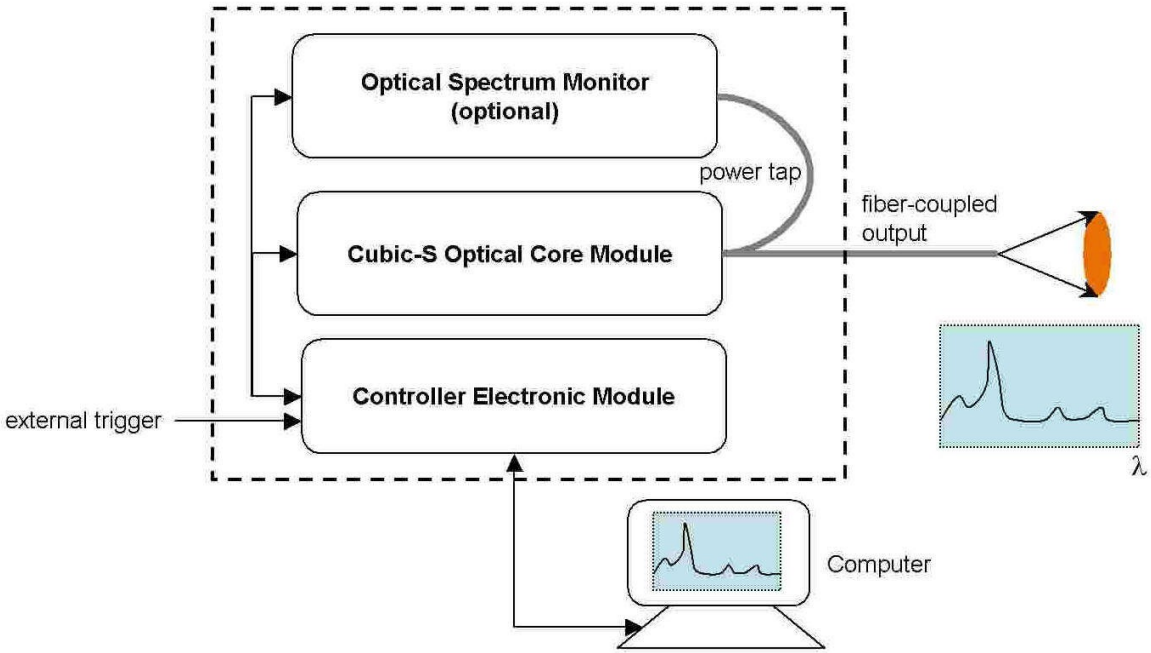



**Figure 1 - Schematic diagram of Cubic-S.**

Mightex's Cubic-S is controlled through a powerful PC-based application software with GUI. A software development kit (SDK) is also included, making it easy to integrate the Cubic-S into customers' own applications.

For more details regarding this product please call 1-416-840-4991 or email sales@mightex.com.

## Table of Content

## MLS Light Sources for Microscopes

**Compatible Microscopes:**

- ***Leica DMI,***
- ***Nikon Eclipse Microscopes,***
- ***Olympus IX & BX Microscopes,***
- ***Zeiss Axioskop***

Mightex microscopy light sources are collimated LED light sources designed for research microscopes. These light sources are ready to be mounted on existing lamp ports of various microscopes to replace traditional light sources such as incandescent lamps and arc lamps. MLS-series of microscopy light sources employs an aspherical collimating optics to generate uniform illuminations with high intensity at the microscope sample plane.

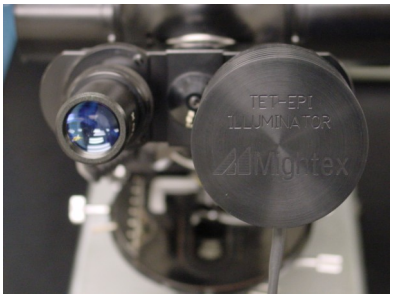
LEDs have many desirable features for microscopy applications. For example LED intensity can be directly modulated through driving current. LEDs also have fast response time, in some cases as short as 10ns. The output spectrum of a white LED changes little with driving current eliminating the needs for neutral density filters. Single-color LEDs have high spectral density making them suitable for applications such as multi-spectrum microscopy. With the state-of-the-art high-brightness technology spectral density of LEDs have reached or exceeded that of some short-arc lamps. LEDs may also be pulsed at current much higher than normal rating, resulting in higher output. Another feature of LEDs is their high stability and repeatability of output intensity compared to that of short -arc lamps.

### PERFORMANCE SPECIFICATIONS

| Part Number | Wavelength (nm) | Maximum Driving Current (mA) | Forward Voltage (V) | Output Power (mW) |
|---|---|---|---|---|
| MLS-0365-XXX | 365 | 500 | 3.8 | 80 |
| MLS-0385-XXX | 385 | 500 | 3.8 | 100 |
| MLS-0400-XXX | 400 | 350 | 3.5 | 100 |
| MLS-0455-XXX | 455 | 1000 | 3.9 | 280 |
| MLS-0470-XXX | 470 | 1000 | 3.9 | 200 |
| MLS-0505-XXX | 505 | 1000 | 3.9 | 135 |
| MLS-0530-XXX | 530 | 1000 | 3.9 | 100 |
| MLS-0590-XXX | 590 | 1000 | 3.9 | 65 |
| MLS-0617-XXX | 617 | 1000 | 3.9 | 280 |
| MLS-0625-XXX | 625 | 1000 | 3.9 | 280 |
| MLS-0657-XXX | 657 | 350 | 2.4 | 100 |
| MLS-0740-XXX | 740 | 350 | 2.2 | 65 |
| MLS-0850-XXX | 850 | 1000 | 2.1 | 175 |
| MLS-0940-XXX | 940 | 700 | 1.5 | 100 |
| MLS-5500-XXX | cool white 5500K | 1000 | 3.9 | 170 |
| MLS-4000-XXX | warm white 4000K | 1000 | 3.9 | 180 |

## Low-Cost LED Based Epi-Fluorescence Microscopy Solution

Episcopic(EPI) or reflective/incident illumination is commonly used in biological microscopy to excite fluorescence. However, most less-expensive biology microscopes such as those used in education and clinic applications are not equipped with epi-fluorescence illuminators. Even in more sophisticated biology microscopes EPI illuminators are only an expensive option. To make epi-fluorescence illumination available on more microscopes, an inexpensive illuminator that can fit on virtually any microscopes without alteration is called for.

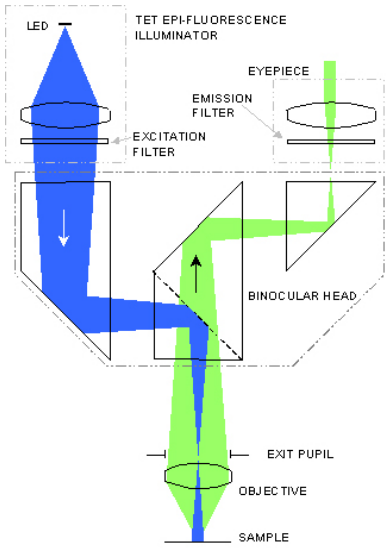



Through-eyetube(TET) EPI illuminators are a unique class of microscope illumination solutions developed and patented by Mightex Systems. A TET-EPI illuminator sends light through one of the eyetubes of a typical binocular head. Light passes through microscope objective and illuminates the sample under observation, same as in a conventional EPI illumination setup. The TET-EPI illuminator fits into an eye tube just like a regular eyepiece. Image can be observed through the other eyepiece or the phototube. Alternatively, TE-EPI illuminator can be inserted into the phototube. In this configuration, images maybe observed through both eyepieces if the microscope is equipped with a beamsplitter between the phototube and the eyetubes.

### PERFORMANCE SPECIFICATIONS

| Parameters | Specification | Unit |
|---|---|---|
| Optical power density at exit pupil | >2 | mW/cm^2 |
| Excitation filter center wavelength | 470 | nm |
| Excitation filter bandwidth | 40 | nm |
| Eyepiece magnification | 10x | - |
| Emission filter wavelength | 510nm long-pass | - |

### SCHEMATIC DIAGRAM of TET-EPI

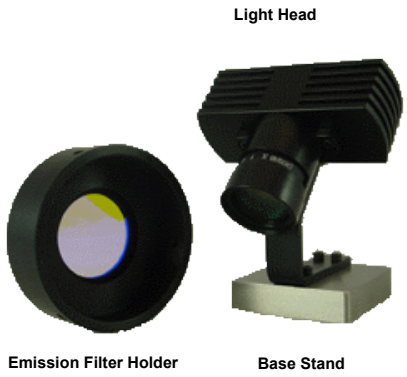



For more details about this product, please call 1-416-840-4991 or email sales@mightex.com.

## FluoFlux Fluorescence LED Illuminators for Stereo-Microscopes

Stereo fluorescence has become a mainstream tool for developmental and cellular biology examinations. With fluorescence labelling, researchers can use stereo-microscopes to observe living organisms, screen samples, as well as to sort or dissect samples. Despite the growing needs, most stereomicroscopes are not equipped with fluorescence capabilities. Only high-end research stereomicroscopes have fluorescence excitation and imaging options. These options are also fairly expensive, often running into tens of thousands of dollars.

Mightex has developed and patented FluoFlux™, a LED–based stereo fluorescence solution that can be retrofit on most stereo microscopes. The solution includes a reflective excitation source and an emission filter fixture (note: filter not included) that can be mounted on lens barrel of the microscope.




### PERFORMANCE SPECIFICATIONS

Table 1. LED Emitter Specifications

| Code | Description | Peak Wavelength (nm) | Iop (mA) | Vop (V) | Radiant Flux (mW) |
|---|---|---|---|---|---|
| 0309 | 3W UV | 395 ~ 410 | 700 | 3.5 | 350 |
| 0301 | 3W Royal Blue | 455 | 1000 | 3.9 | 450 |
| 0302 | 3W Blue | 470 | 1000 | 3.9 | 480 |
| 0303 | 3W Cyan | 505 | 1000 | 3.9 | 280 |
| 0304 | 3W Green | 530 | 1000 | 3.9 | 135 |
| 0305 | 3W Amber | 590 | 1400 | 3.0 | 210 |
| 0306 | 3W Red-Orange | 617 | 1400 | 3.0 | 660 |
| 0307 | 3W Red | 625 | 1400 | 3.0 | 630 |
| 0208 | 2.4W Near Infrared | 850 | 1000 | 1.8~2.4 | 375 |

Table 2. Emission Holder

| Holder Code | Inner diameter (mm) | Emission Filter diameter (mm) |
|---|---|---|
| **66** | **66** | **36** |
| **60** | **60** | **36** |
| **55** | **55** | **36** |
| **50** | **50** | **36** |
| **45** | **45** | **36** |
| **00** | **No holder** | **NA** |

## FilterReader Spectrophotometer

Ever wondered what's in your filter cube? FilterReader spectrophotometer will give you the answer in a few seconds.

Identifying and confirming transmission characteristics of filters and beam splitters used in fluorescence microscopy is often critical especially when troubleshooting a system or an experiment. To address this need Mightex has developed the FilterReader, a unique mini spectrophotometer specifically designed for measuring spectral transmission of excitation filters, dichroic beam splitters, and emission filters. A high-resolution CCD spectrograph coupled with a solid-state light source provides high dynamic range measurements in a compact package. A sample cart holds excitation filters and emission filters at vertical position, and beam splitters at a 45-degree angle.

FilterReader is a fully integrated spectrophotometer with a footprint of a book. All one needs is a PC to run the control software, which communicates with the FilterReader via a USB interface. FilterReader software guides users through an intuitive work flow which leads to the measurement results after a few clicks. Results can be displayed in spectral transmission or optical density. Measurements of filters and beam splitters can be overlaid on a single chart. Various data saving and chart printing functions are supported.

Unlike traditional spectrophotometers, FilterReader spectrophotometers are small enough to be easily stored when not in use. The solid-state light source in the FilterReader also ensures a trouble-free use for years without the need to change the light source.


### PERFORMANCE SPECIFICATIONS

| Parameters | Specifications | | Unit |
|---|---|---|---|
| Model | **FRD-350-AU** | **FRD-385-AU** | |
| Wavelength Range | 350 ~ 720 | 385 ~ 720 | nm |
| Dynamic Range | >1000:1 (OD3) | >1000:1 (OD3) | |
| Filter Size | f25.4 or smaller | f25.4 or smaller | mm |
| Beam splitter Size | up to 27 x 36 | up to 27 x 36 | mm |
| PC Interface | USB2.0 | USB2.0 | |
| DC Power Supply | 12V/1A (included) | 12V/1A (included) | |
| Dimensions | 41.5 x 108 x 48.5 | 41.5 x 108 x 48.5 | mm |
| Weight | 1,275 | 1,275 | g |

## High-Resolution High-Stability CCD Spectrometers

Compact CCD spectrometers are widely used in process control, environment monitoring, and scientific research applications. Mightex HRS series compact CCD spectrometers features a high-resolution 100mm Czerny-Turner optical platform coupled with a Toshiba 3648-element CCD array. The optimized optical path yields both high spectral resolution and high light collection efficiency.

Wavelength and amplitude stability is often a critical requirement for many spectrometer applications. All optical components in the HRS series spectrometers are mounted directly on a single-piece base without using screws. A box enclosure structure further increases stiffness of the base. The proprietary mounting method ensures high stability over time and temperature.

A 16-bit DAC is used to convert the analog signal from the CCD array into a digital stream. The electronics hardware also includes trigger input and four programmable digital I/Os for interfacing with other equipment such as a light source. The spectrometer is controlled through a USB2.0 interface which also supplies all the electric power needed to operate the spectrometer.

Standard software package includes a full-featured PC software as well as a software development kit (SDK) for further software development.

### PERFORMANCE SPECIFICATIONS

| Parameters | Specifications | | | | Unit |
|---|---|---|---|---|---|
| Model | HRS-UV1-025 | HRS-VIS-025 | HRS-NIR-025 | HRS-BD1-025 | - |
| Optical Platform | f/4, Czerny-Turner | | | | - |
| Focal Length | 100 | | | | mm |
| Wavelength Range | 200~400 | 390~780 | 600~1000 | 300~1050 | nm |
| Resolution* | 0.25 | 0.4 | 0.5 | 0.9 | nm |
| Order Sorting Filter | Long pass | Long pass | Long pass | Spatially Variable Filter | - |
| Entrance Slit | 5, 10, 25, 50, 100, 200 or no slit | | | | μm |
| Input Fiber Connector | SMA 905 | | | | - |
| Input Fiber NA | 0.22 | | | | - |
| Detector | Toshiba TCD1304AP Linear CCD Array | | | | - |
| Pixel Number | 3648 | | | | - |
| Pixel Size | 8 x 200 | | | | μm |
| Pixel Well Depth | 100,000 | | | | electron |
| Signal-to-noise Ratio | 1000:1 (at full scale) | | | | - |
| A/D Resolution | 16 | | | | bit |
| Integration Time | 0.1 to 6,500 | | | | ms |
| Frame Rate | up to 138 | | | | fps |
| GPIO | 4 programmable digital I/Os | | | | - |
| Trigger Input | Yes | | | | - |
| PC Interface | USB 2.0 | | | | - |
| Trigger/GPIO Interface | DIN8 | | | | - |
| PC Operating System | Windows 2000/XP/Vista/7 | | | | - |
| Power Consumption | 300 (at 5V) | | | | mA |
| Dimensions | 138 x 108 x 37 | | | | mm |
| Weight | 510 | | | | g |

# WARRANTY TERMS AND CONDITIONS

MIGHTEX's end user products and OEM modules are warranted to be free from defects in materials and workmanship for a period of 12 months and 6 months ("Warranty Period"), respectively, from the date of initial shipment. MIGHTEX'S liability under this warranty is limited to replacing any defective parts at its expense. MIGHTEX shall warrant the replacement products for the remainder of the original warranty period.

This warranty will not apply to those products: (i) repaired or altered other than in accordance with MIGHTEX's product specifications or written approval by MIGHTEX's duly authorized officer, or (ii) abused, misused, improperly handled in use or storage, or used in an unauthorized or improper manner or without following written procedures supplied by MIGHTEX, or (iii) original identification markings or labels have been removed, defaced or altered, or (iv) any other claims not arising directly from material defects in material or workmanship.

For board-level products (e.g. board-level cameras etc.) on which electronics components are exposed, one should be properly grounded when handling the products, in order to avoid Electro-Static Discharge (ESD) related damages. ESD related damages (which are considered as mis-handling) are not covered by product warranty.

Special contracts or contracts for nonstandard products may have modified terms of warranty and, in such cases, the terms as stated in the individual contract must be signed by the duly authorized officer of MIGHTEX and will supersede the standard terms.

MIGHTEX will make final determination as to cause or existence of defect and, at its option repair or replace the products, which prove to be defective during the warranty period. Products replaced under warranty will be warranted only for the balance of the warranty period from the original supplied equipment.

This warranty extends only to the original purchaser of the equipment from MIGHTEX. The purchaser must notify MIGHTEX within 15 days of first noticing the defect and promptly return the defective product upon receipt of RMA number(s) before expiration of the warranty period.

Products believed by purchaser to be defective shall be returned to MIGHTEX, with transportation and insurance prepaid by purchaser. Repaired or replaced products will be returned to purchaser by MIGHTEX, FOB city destination within the Continental United States and Canada, Transportation beyond these limits will be charged to purchaser.

The warranty set out in above paragraph is the exclusive warranty made by MIGHTEX and is in lieu of all other warranties (except for specific product performance warranties), whether written, oral, or implied, including any warranty of merchantability or fitness for a particular purpose, and shall be CUSTOMER'S sole remedy and MIGHTEX'S sole liability on contract or warranty of otherwise for the products. This warranty shall not be modified or amended without the written approval of an officer of MIGHTEX.

IN NO EVENT SHALL MIGHTEX BE LIABLE FOR ANY INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM THE FAILURE TO PERFORM UNDER THIS AGREEMENT OR THE FURNISHING, PERFORMANCE OR USE OF ANY GOODS OR SERVICES SOLD PURSUANT HERETO, WHETHER DUE TO BREACH OF CONTRACT, BREACH OF WARRANTY, NEGLIGENCE OR OTHERWISE.

# CANCELLATION AND RETURN POLICY

After acceptance by the Seller, the Buyer's order is not subject to cancellation, change, reduction in amounts, or suspension or delay of shipment, except with the Seller's written consent. Cancelled orders consented to by the Seller are subject to cancellation charges, based upon all expenses incurred by the Seller up to the time of cancellation, including a reasonable profit on such expenses. This includes excess inventory of stock items that have been specifically allocated to the Buyer and exceed normal Seller inventory levels for a period. Seller may cancel the order in the following cases: the seller's costs have exceeded selling price to Buyer; the Seller is unable to provide product due to factors beyond the Seller's control.

If shipments are delayed by Buyer, payment shall become due on the date when Seller is prepared to make shipment unless otherwise agreed to in writing by Seller at time of incident. Products held for the Buyer shall be at the risk and expense of the Buyer.

To return Catalog Products, Buyer must contact Seller within 14 days of receipt to attain a Return Merchandise Authorization (RMA) Number. A 15% or a minimum of US$50 restocking fee will be charged, and the Buyer is responsible for the shipping cost. After 14 days, the RMA number is still required; however, unless otherwise provided in a specific warranty, only products found to be defective are accepted for repair or replacement within the Warranty Period (as stated in Mightex's "Warranty Terms and Conditions") from invoice date. Return authorizations are valid 14 days from issue. All returned Products are subject to inspection and approval by Seller before issuing credit or replacement. Products displaying use, misuse, or other damage will not be accepted. Products must be in original manufacturer's packaging. Products should be packaged in a separate carton with the return authorization number clearly marked on this shipping carton. Refunds are issued by check for pre-paid merchandise. Credit order refunds are issued to the credit card or Seller's open account to which the Product was charged.

IMPORTANT:
Other than as expressly set forth above or as contained in any express warranties provided with products and the extent permitted by law, the seller makes no warranties, express or implied, including warranties of merchantability or fitness of the merchandise for any particular purpose. The seller shall not be liable for loss or damage resulting from the use or performance of the products. In no event shall the seller be liable to the buyer or its customers for any special, indirect, incidental, exemplary or punitive damages resulting from loss of use, interruption of business, or lost profits, even if the seller has been advised of the possibility of such damages. Notwithstanding the foregoing, in no event shall the seller's aggregate liability to the buyer and its customers exceed the amount paid for products purchased under this agreement in the prior 6 months.

GOVERNING LAW:
Sales transactions are governed by the internal law of the Province of Ontario, Canada. and you agree to the exclusive jurisdiction of the Ontario courts in the event of any dispute.

TAXES:
We collect sales tax on shipments to: (a) all Canadian provinces and territories, and (b) CA addresses, unless the purchaser supplies us with a signed official state resale certificate or sales tax exemption certificate with the order. Purchasers outside the aforementioned states/provinces are responsible for their state or local sales/use tax, if any, and any other taxes payable by reason of this transaction.

WARRANTY AND SAFETY INFORMATION:
Please refer to Mightex's Warranty Terms and Conditions.

REPAIRS:
If your unit is out of warranty but needs repairs, please write to us for repair information.

**Mightex Systems**
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