### Selection

The table below lists selectable items including detector cameras, lasers, objective lenses and probers.

<table>
<thead>
<tr>
<th>Port for Selection</th>
<th>Applicable items</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAMRA: 3</td>
<td>3-pin din connector (20 time-resolved detectors)</td>
</tr>
<tr>
<td>CAMRA: 2</td>
<td>3-pin din connector (20 time-resolved detectors)</td>
</tr>
</tbody>
</table>

#### Laser Selection

- Selectable lens

<table>
<thead>
<tr>
<th>Objective</th>
<th>10µm Lens</th>
<th>15µm Lens</th>
<th>30µm Lens</th>
<th>45µm Lens</th>
<th>60µm Lens</th>
<th>90µm Lens</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.14x</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>2.14x</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>

#### Objective Lens

- 1-hole turret

<table>
<thead>
<tr>
<th>1-hole turret</th>
<th>2-hole turret</th>
<th>3-hole turret</th>
<th>4-hole turret</th>
<th>5-hole turret</th>
<th>6-hole turret</th>
</tr>
</thead>
<tbody>
<tr>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>

### Specifications

- Detector
  - Wavelength sensitivity: 950 nm to 1600 nm
  - Effective field of view: 7.8 mm x 7.8 mm

#### Lens Information

- 10-position turret (selectable option)
- 15-position turret (selectable option)

#### Utility

- Power consumption: 1400 VA
- Weight: 45 kg approx.
- Dimensions/Weight: H: 800 mm x D: 1000 mm x W: 1270 mm

### Dimensions/Weight

- Optional probers
- Optional objective lenses
- Optional objective lenses and probers.

### Laser Safety

Hamamatsu Photonics classifies laser diodes, and provides appropriate safety measures and labels according to the classification as required for manufacturers according to IEC 60825-1. When using this product, follow all safety measures according to the IEC.

**CLASS I LASER PRODUCT**

**Description Label (Sample)**

**Cautions**

- Product and software package names noted in this documentation are trademarks or registered trademarks of their respective manufacturers.
- Information furnished by Hamamatsu Photonics is believed to be reliable. However, no responsibility is assumed for possible inaccuracies or omissions.
- Specifications and external appearance are subject to change without notice.

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Picosecond time resolution allows fast discovery of LSI timing problems.

The low voltage operation and increasing numbers of layers with small geometry required for advanced chip design make it difficult to analyze the internal operations of LSI timing using conventional techniques. The TriPHEMOS applies a highly sensitive 2-D near-infrared detector to capture the extremely faint light emitted from transistors during the LSI switching operation. Utilizing simultaneous measurements makes it possible to observe transistor timing transitions down to the picosecond region.

Dynamic measurements of light emissions from LSI devices

CMOS transistors inside LSI devices emit light due to the flow of current when voltage is applied across the source and drain of a transistor. The resulting light emission phenomena can be divided into transient states and quiescent states.

- **Measuring transient light emissions (transient state)**
  Transitions from ON to OFF or vice versa occur in transistors inside LSI devices when their logic state is switched. A transient current flow in the transistor emits an impulsive light. Making time-resolved measurements of the wave-form of the impulse light allows the time to be measured precisely down to the picosecond region.

- **Measuring quiescent light emissions (quiescent state)**
  Applying voltage to a transistor will cause current to flow and emit light whether the transistor is held in an ON or OFF state. The phenomenon differs according to the voltage applied to the transistor and the Gate voltage. The sub-threshold voltages that determine the characteristics of transistors and the numbers of defects also affect the amount of leakage in the flow of current when the transistor is OFF. Analyzing the light emission in a quiescent state makes it possible to locate defect points and track parameters such as fluctuations in transistor characteristics, and anomalies in LSI power supplies, etc.

Features

- New detector with sensitivity up to 1600 nm
  New detector has sensitivity from 950 nm to 1600 nm while conventional one was up to 1400 nm. This extended spectrum sensitivity improves the detectability for backside analysis and for low voltage drive ICs.

- New TDC (Time to Digital Converter) reduces analysis time
  Newly designed TDC (Time to Digital Converter) capable to measure light emissions taken in 10 ms* with 12.5 ps time resolution. The dedicated analysis software enables to pick up the result in any time window from whole measurement range to investigate each event more in detail.

Optional

- CAD Navigation Software (optional)
  The optional CAD navigation interface software enables the user to overlay emissions on the CAD data for further analysis.

- EO Probing Unit C12323-01
  The EO Probing Unit is a tool to observe a transistor’s status through the Si substrate using an incoherent light source. It is composed of the EOP (Electro Optical Probing) to measure operation voltage of a transistor rapidly and the EOPM (Electro Optical Frequency Mapping) to image active transistors at a specific frequency.

Measurement principle

When light intensity is reduced to a very low level, it is well known that light is observed as quantum particles called photons. Light emitted from transistors is also at the same low intensity level, and it is measured as the probability density distribution of photons over time. Even during transient light emissions caused by transistor switching where the peak intensity is comparatively high, the number of detectable photons is said to be only about 1 to 1000 photons per 10⁷ switches. To obtain an emission light waveform with a good S/N ratio, the logic state of the transistor must be repeatedly switched and the detected photon count then integrated to improve the S/N ratio. Time-correlated single photon counting (TCSPC), which has been used in fluorescence observation, is an effective technique for making highly accurate time-resolved measurements at very low light levels by integrating signals in repeated operations. The TriPHEMOS uses a two-dimensional detector capable of making measurements with the TCSPC method. This detector makes use of a newly developed InGaAs/InP near-infrared photocathode whose spectral response range matches the light emission wavelengths of the transistor.
### Selection

The table below lists selectable items including detector cameras, lasers, objective lenses and probers.

#### Port for Selections

<table>
<thead>
<tr>
<th>Port for Selections</th>
<th>For CAMETER 3 (if 2 lasers are used a 5/5 time resolved detector)</th>
<th>For LASSER 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camera Selection</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Laser Selection</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Objective Lens</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Hole turret</td>
<td>✔️</td>
<td>✔️</td>
</tr>
</tbody>
</table>

#### Option for Lens

<table>
<thead>
<tr>
<th>Objective Lens</th>
<th>Standard composition</th>
<th>Optional composition</th>
</tr>
</thead>
<tbody>
<tr>
<td>22.5 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>880 mm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Optional

- [ ] 880 mm Laser (100 mW): A11315-06
- [ ] 880 mm Laser (50 mW): A11315-03
- [ ] 880 mm Laser 100 mW/C/C: C9985-01
- [ ] 880 mm Laser 50 mW/PU: C9985-06
- [ ] 5 hole turret
- [ ] 10 hole turret

#### Dimensions/Weight

<table>
<thead>
<tr>
<th>Dimensions/Weight</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions/Weight</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Specifications

#### Detector

- Wavelength sensitivity: 950 nm to 1600 nm
- Effective field of view: 7.8 mm × 7.8 mm

#### Structure

- Inverted type

#### Time Resolved Imaging

- Trigger: Internal or External
- Min. time resolution: 12.5 ps

#### Software

- Measurement control, Analysis, CAD Navigation
- Optional

#### Utility

- Line voltage: AC, 220 V (50 Hz/60 Hz)
- Power consumption: 4400 VA
- Vacuum: Approx. 80 kPa or more (Using prober)
- Compressed air: 0.5 Mpa to 0.7 Mpa

### Dimensions/Weight

#### Dimensions/Weight

- 100 mm × 150 mm × 150 mm

#### Weight

- 100 kg to 255 kg

### Options

- [ ] Standard composition
- [ ] Optional composition

### LASER SAFETY

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