**FEATURES**

- Compact Size: 13 mm (1/2 inch) Diameter (Effective area: ø10 mm)
- Low and Stable Dark Count
- R12421 with HA Treatment (R12421-00-01)
- R12421 with HA Treatment and Magnetic Shield (R12421-00-03, R12421P)
- R12421 with Voltage Divider Circuit, HA Treatment and Magnetic Shield (H12690 Series)
- High Sensitivity Type in 500 nm to 700 nm: R12421-300

**APPLICATIONS**

- Biomedical Applications (Bioluminescence, Chemiluminescence)
- Scintillation Counting (Radiation monitor)
- Light Scatter Detection

**GENERAL**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>R12421 Series</th>
<th>H12690 Series</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spectral Response</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Window Material</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Photocathode</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dynode</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating Ambient Temperature</td>
<td>-30 to +50</td>
<td>0 to +50</td>
<td>°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>R12421, R12421-300: -80 to +50</td>
<td>Others: -30 to +50</td>
<td>°C</td>
</tr>
<tr>
<td>Suitable Socket</td>
<td>E678-13F (supplied)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**MAXIMUM RATINGS (Absolute Maximum Values)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>R12421 Series</th>
<th>H12690 Series</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage</td>
<td>Between Anode and Cathode</td>
<td>1250</td>
<td>-1250</td>
</tr>
<tr>
<td>Average Anode Current</td>
<td>0.1</td>
<td>0.016</td>
<td>mA</td>
</tr>
</tbody>
</table>

**CHARACTERISTICS (at 25 °C)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>R12421 Series / H12690 Series</th>
<th>R12421-300</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cathode Sensitivity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anode Sensitivity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gain</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anode Dark Current (after 30 min storage in darkness)</td>
<td>0.5</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Dark Count (after 30 min storage in darkness)</td>
<td>80</td>
<td>400</td>
<td>1200</td>
</tr>
<tr>
<td>Time Response</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pulse Linearity</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:**

- Anode characteristics are measured at 1000 V (H12690 series: -1000 V) with the voltage distribution ratio shown below.
- Dark count is a guaranteed value.

**VOLTAGE DISTRIBUTION RATIO AND SUPPLY VOLTAGE**

<table>
<thead>
<tr>
<th>Electrodes</th>
<th>K</th>
<th>Dy1</th>
<th>Dy2</th>
<th>Dy3</th>
<th>Dy4</th>
<th>Dy5</th>
<th>Dy6</th>
<th>Dy7</th>
<th>Dy8</th>
<th>Dy9</th>
<th>Dy10</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ratio</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Supply Voltage: 1000 V (H12690 series: -1000 V), K: Cathode, Dy: Dynode, P: Anode
**PHOTOMULTIPLIER TUBES AND PHOTOMULTIPLIER TUBE ASSEMBLIES**

**R12421 SERIES / H12690 SERIES**

**Figure 1: Typical Spectral Response**

![Spectral Response Graph]

**Figure 2: Typical Gain**

![Gain Graph]

**Figure 3: Time Response (Example)**

![Time Response Graph]

**Figure 4: Single Photon Pulse Height Distribution (Example)**

![Pulse Height Distribution Graph]

**Figure 5: Plateau Characteristics (Example)**

![Plateau Characteristics Graph]

**Figure 6: Dark Count Stability (Example)**

![Dark Count Stability Graph]
Figure 7: Dark Count vs. Temperature (Example)

![Graph showing dark count vs. temperature example](image)

Figure 8: Block Diagram for Photon Counting

![Block diagram for photon counting](image)

Figure 9: Dimensional Outline and Basing Diagram (Unit: mm)

- **R12421, R12421-300**
- **R12421-00-01**
- **R12421-00-03, R12421P**

![Basing diagrams for different models](image)

Figure 10: Socket (Supplied)

**E678-13F**

![Socket diagram](image)

Figure 11: Socket Assembly (Sold Separately)

**E849-99**

![Socket assembly diagram](image)

* HAMAMATSU also provides C4900 series and C10940 series high voltage power supply modules.
Photon counting head H12775 consisting of R12421, high voltage power supply circuit, divider circuit, and photon counting circuit, is also available.

HAMILTON HAMAMATSU PHOTONICS K.K., www.hamamatsu.com

HAMAMATSU PHOTONICS K.K., Electron Tube Division
314-5, Shimokanmo, Iwata City, Shizuoka Pref., 438-0193, Japan, Telephone: (81)539/62-5248, Fax: (81)539/62-2205

U.S.A.: Hamamatsu Corporation: 365 Foothill Road, Bridgewater, N.J. 08807-0910, U.S.A., Telephone: (1)908-231-0960, Fax: (1)908-231-1218 E-mail: usa@hamamatsu.com

Germany: Hamamatsu Photonics Deutschland GmbH, Arzbergstr. 10, D-82211 Herrsching am Ammersee, Germany, Telephone: (49)8152-375-0, Fax: (49)8152-2658 E-mail: info@hamamatsu.de

France: Hamamatsu Photonics France S.A.R.L.: 19, Rue du Saule Trapu, Parc du Moulin de Massy, 91882 Massy Cedex, France, Telephone: (33)1 69 53 71 00, Fax: (33)1 69 53 71 10 E-mail: infos@hamamatsu.fr

Italy: Hamamatsu Photonics Italia S.r.l.: Strada della Moia, 1 int. 6, 20020 Arese (Milano), Italy, Telephone: (39)02-93581733, Fax: (39)02-93581741 E-mail: info@hamamatsu.it

China: Hamamatsu Photonics (China) Co., Ltd.: B1201 Jjingming Center, No.27 Dongsanlu Beilu, Chaoyang District, Beijing 100020, China, Telephone: (86)10-6586-6088, Fax: (86)10-6586-3866 E-mail: hpc@hamamatsu.com.cn

Figure 12: Dimensional Outline and Diagram (Unit: mm)

- **H12690**
  - **PHOTO-CATHODE**
  - **MAGNETIC SHIELD (d=0.2) WITH HEAT SHRINKABLE TUBE**
  - **PMT, R12421 WITH HA TREATMENT**
  - **POM HOUSING**
  - **12 x 4 x 0.5**
  - **SIGNAL OUTPUT RG-174U (BLACK)**
  - **PMT**
  - **CATHODE**
  - **PHOTO**
  - **10 MIN.**
  - **+50 ± 3**
  - **1500 ± 3**
  - **-0**
  - **± 0.5**
  - **Max. High Voltage = -1250 V**
  - **Divider Current = 0.32 mA**
  - ***Magnetic shield is connected to -HV inside of this product.**

- **H12690-00-01**
  - **PHOTO-CATHODE**
  - **MAGNETIC SHIELD (d=0.2) WITH HEAT SHRINKABLE TUBE**
  - **PMT, R12421 WITH HA TREATMENT**
  - **POM HOUSING**
  - **12 x 4 x 0.5**
  - **SIGNAL OUTPUT RG-174U (BLACK)**
  - **PMT**
  - **CATHODE**
  - **PHOTO**
  - **10 MIN.**
  - **+50 ± 3**
  - **1500 ± 3**
  - **-0**
  - **± 0.5**
  - **Max. High Voltage = -1250 V**
  - **Divider Current = 0.32 mA**
  - ***Magnetic shield is connected to -HV inside of this product.**

- **H12690-00-02**
  - **PHOTO-CATHODE**
  - **MAGNETIC SHIELD (d=0.2) WITH HEAT SHRINKABLE TUBE**
  - **PMT, R12421 WITH HA TREATMENT**
  - **POM HOUSING**
  - **12 x 4 x 0.5**
  - **SIGNAL OUTPUT RG-174U (BLACK)**
  - **PMT**
  - **CATHODE**
  - **PHOTO**
  - **10 MIN.**
  - **+50 ± 3**
  - **1500 ± 3**
  - **-0**
  - **± 0.5**
  - **Max. High Voltage = -1250 V**
  - **Divider Current = 0.32 mA**
  - ***Magnetic shield is connected to -HV inside of this product.**