

### High Anode Sensitivity at Low Supply Voltage, 13mm (1/2 Inch) Diameter, 10 Stage, Head-On Type, Multialkali Photocathode, (185nm to 850nm)

The Hamamatsu R1463 is a 13mm (1/2") diameter, head-on type photomultiplier tube having a multialkali photocathode designed for use in UV to near IR spectrophotometers and other analysis equipments where wide range response and high gain are of importance. The R1463 exhibits a high anode sensitivity at relatively low supply voltage by virtue of improvement in secondary emitting surface. The R1463P is for photon counting with low dark counts. It has an HA coating with a magnetic shield for decreasing glass scintillations.

#### FEATURES

- High Anode Sensitivity  
Radiant (420nm) .....  $5.1 \times 10^4$  A/W at 1000V  
Luminous ..... 120 A/lm at 1000V
- High Quantum Efficiency (290nm) ..... 19%
- Wide Spectral Response ..... 185 to 850nm
- Low Anode Dark Current ..... 4 nA at 1000V

#### APPLICATIONS

- UV to Near IR Spectrophotometers
- Laser Detection Systems
- Photon Counting Systems

#### GENERAL

| Parameter                                    |                               | R1463                | R1463P | Unit    |
|----------------------------------------------|-------------------------------|----------------------|--------|---------|
| Spectral Response                            |                               | 185 to 850           |        | nm      |
| Wavelength of Maximum Response               |                               | 420                  |        | nm      |
| Photocathode                                 | Material                      | Multialkali          |        | —       |
|                                              | Minimum Useful Area           | 10                   |        | mm dia. |
| Window Material                              | Material                      | UV glass             |        | —       |
|                                              | Shape                         | Plano-plano          |        | —       |
| Dynode                                       | Secondary Emitting Surface    | Multialkali          |        | —       |
|                                              | Structure                     | Linear focused       |        | —       |
|                                              | Number of Stages              | 10                   |        | —       |
| Direct Interelectrode Capacitances (Approx.) | Anode to Last Dynode          | 1.2                  |        | pF      |
|                                              | Anode to All Other Electrodes | 2.0                  |        | pF      |
| Base                                         |                               | 13-pin glass base    |        | —       |
| Weight                                       |                               | 8                    | 14     | g       |
| Suitable Socket                              |                               | E678-13A (Supplied)  |        | —       |
| Suitable Socket Assembly                     |                               | E849 series (option) |        | —       |

#### MAXIMUM RATINGS (Absolute Maximum Values)

| Parameter                            |                               | Value      | Unit               |
|--------------------------------------|-------------------------------|------------|--------------------|
| Supply Voltage                       | Between Anode and Cathode     | 1250       | Vdc                |
|                                      | Between Anode and Last Dynode | 250        | Vdc                |
| Average Anode Current <sup>A</sup>   |                               | 0.03       | mA                 |
| Average Cathode Current <sup>A</sup> |                               | 100        | nA/cm <sup>2</sup> |
| Ambient Temperature                  |                               | -80 to +50 | °C                 |

# PHOTOMULTIPLIER TUBES R1463, R1463P

## CHARACTERISTICS (at 25°C)

| Parameter                                                                         |                                       | Min. | Typ.                  | Max. | Unit  |
|-----------------------------------------------------------------------------------|---------------------------------------|------|-----------------------|------|-------|
| Cathode Sensitivity                                                               | Luminous <sup>B</sup>                 | 80   | 120                   | —    | μA/lm |
|                                                                                   | Radiant at 420nm                      | —    | 51                    | —    | mA/W  |
|                                                                                   | at 633nm                              | —    | 19                    | —    | mA/W  |
|                                                                                   | Quantum Efficiency at 290nm           | —    | 19                    | —    | %     |
|                                                                                   | Red/White Ratio <sup>C</sup>          | 0.15 | 0.2                   | —    | —     |
| Anode Sensitivity <sup>D</sup>                                                    | Luminous <sup>E</sup>                 | 30   | 120                   | —    | A/lm  |
|                                                                                   | Radiant at 420nm                      | —    | 5.1 × 10 <sup>4</sup> | —    | A/W   |
|                                                                                   | at 633nm                              | —    | 1.9 × 10 <sup>4</sup> | —    | A/W   |
| Gain <sup>D</sup>                                                                 |                                       | —    | 1 × 10 <sup>6</sup>   | —    | —     |
| Anode Dark Current <sup>D</sup> (After 30 minute storage in the darkness)         |                                       | —    | 4                     | 20   | nA    |
| Anode Dark Count <sup>D</sup> (After 3 hour storage in the darkness) (for R1463P) |                                       | —    | 900                   | 1000 | cps   |
| Time Response                                                                     | Anode Pulse Rise Time <sup>D, F</sup> | —    | 2.5                   | —    | ns    |
|                                                                                   | Electron Transit Time <sup>D, G</sup> | —    | 24                    | —    | ns    |

### NOTES

- A: Averaged over any interval of 30 seconds maximum.
- B: The light source is a tungsten filament lamp operated at a distribution temperature of 2856K. The light input is 10<sup>-3</sup> lumen. Supply voltage is 150 volts between the cathode and all other electrodes connected together as anode.
- C: Red/White Ratio is the quotient of the cathode current measured using a red filter (Toshiba R-68) interposed between the light source and the tube by the cathode current measured with the filter removed under the same conditions as Note B.
- D: Measured with the anode-to-cathode supply voltage and voltage distribution ratio shown in Table 1.
- E: The light input is 10<sup>-8</sup> lumens with the same light source as Note B.
- F: The rise time is the time for the output pulse to rise from 10% to 90% of the peak amplitude when the entire photocathode is illuminated by a delta function light pulse.
- G: The electron transit time is the interval between the arrival of a delta function light pulse at the entrance window of the tube and the time the output pulse reaches the peak amplitude. In measurement the entire photocathode is illuminated.

Table 1: VOLTAGE DISTRIBUTION RATIO

| Electrodes         | K | Dy1 | Dy2 | Dy3 | Dy4 | Dy5 | Dy6 | Dy7 | Dy8 | Dy9 | Dy10 | P |
|--------------------|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|---|
| Distribution Ratio | 1 | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1    | 1 |

Supply Voltage: 1000Vdc, K: Cathode, Dy: Dynode, P: Anode

Figure 1: Typical Spectral Response

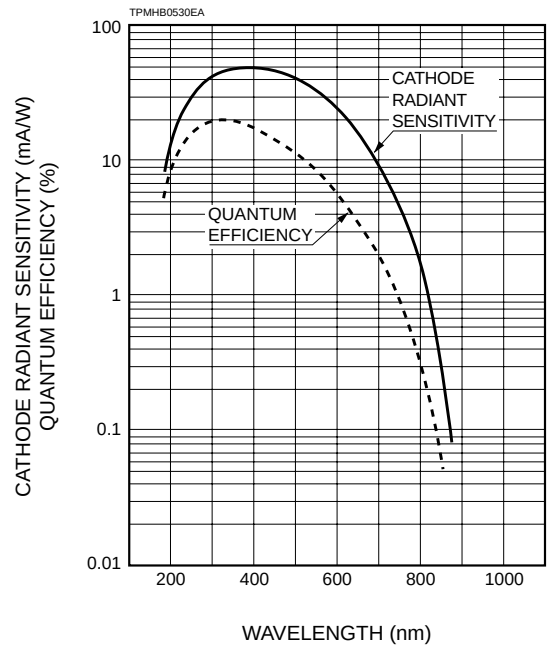


Figure 2: Anode Sensitivity and Gain Characteristics

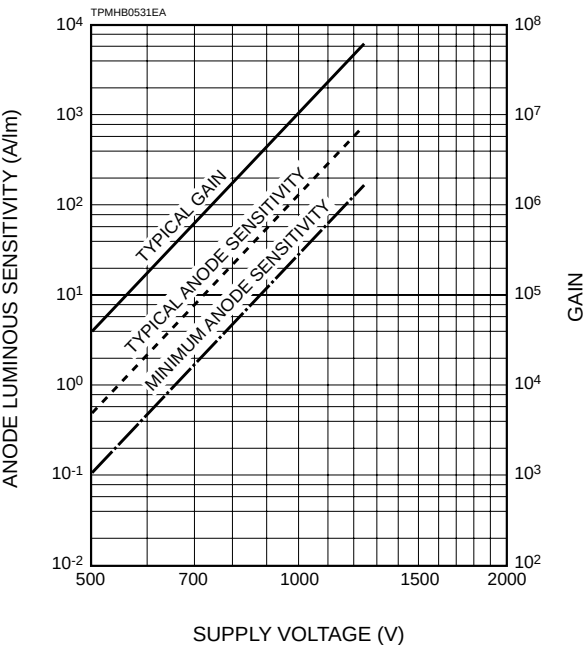


Figure 3: Typical Time Response

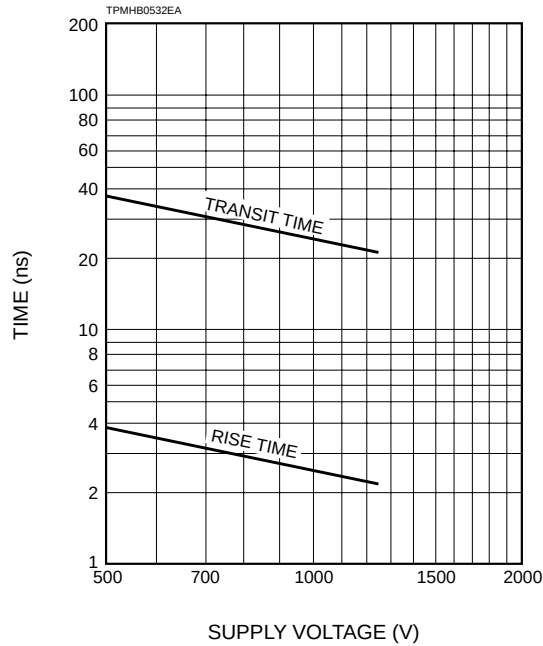


Figure 4: Typical Temperature Coefficient of Anode Sensitivity

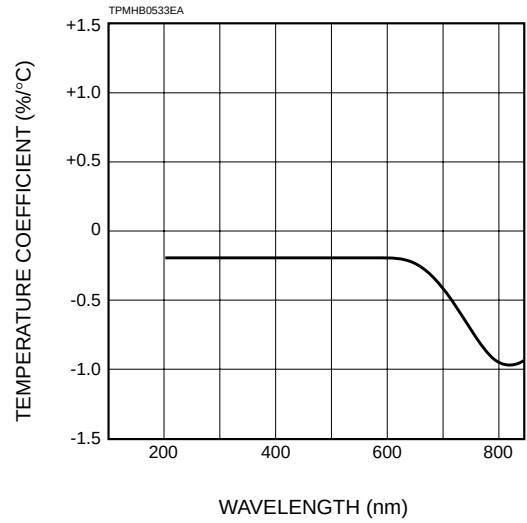


Figure 5: Typical Temperature Characteristic of Dark Current and Dark Counts (R1463P)

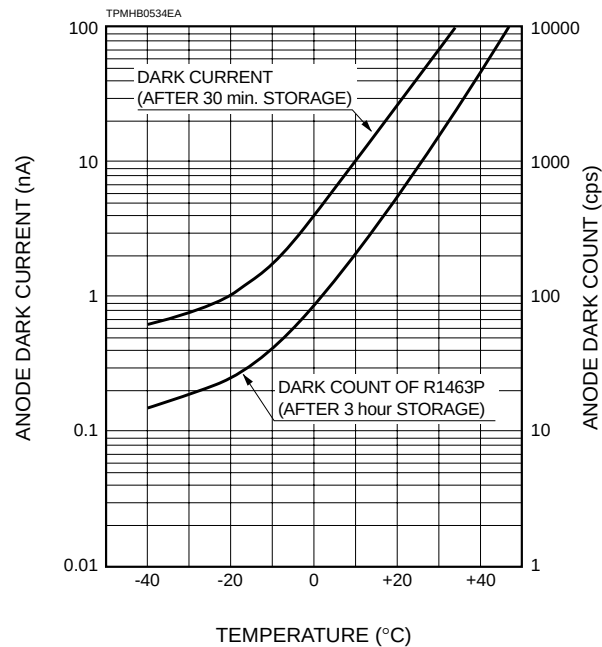
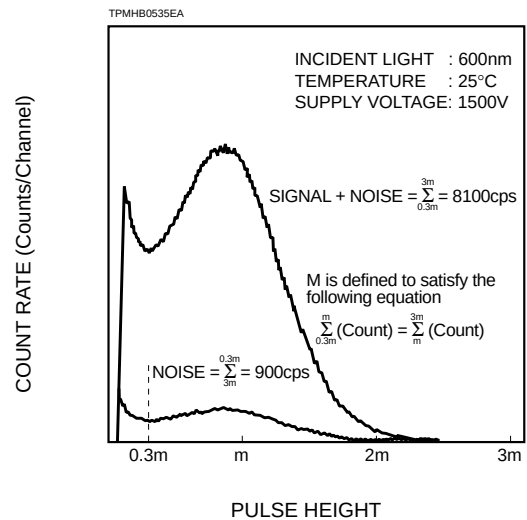


Figure 6: Typical Single Photoelectron Pulse Height Distribution (R1463P)



# PHOTOMULTIPLIER TUBES R1463, R1463P

Figure 7: Dimensional Outline and Basing Diagram (Unit: mm)

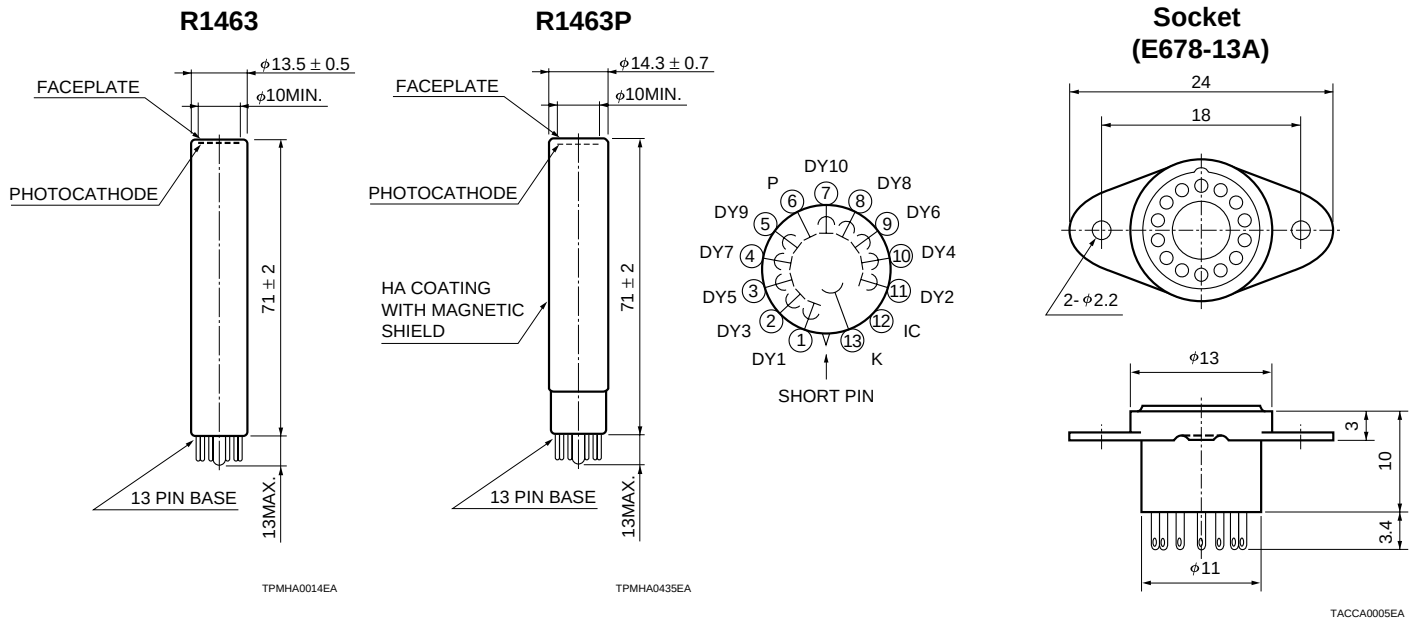
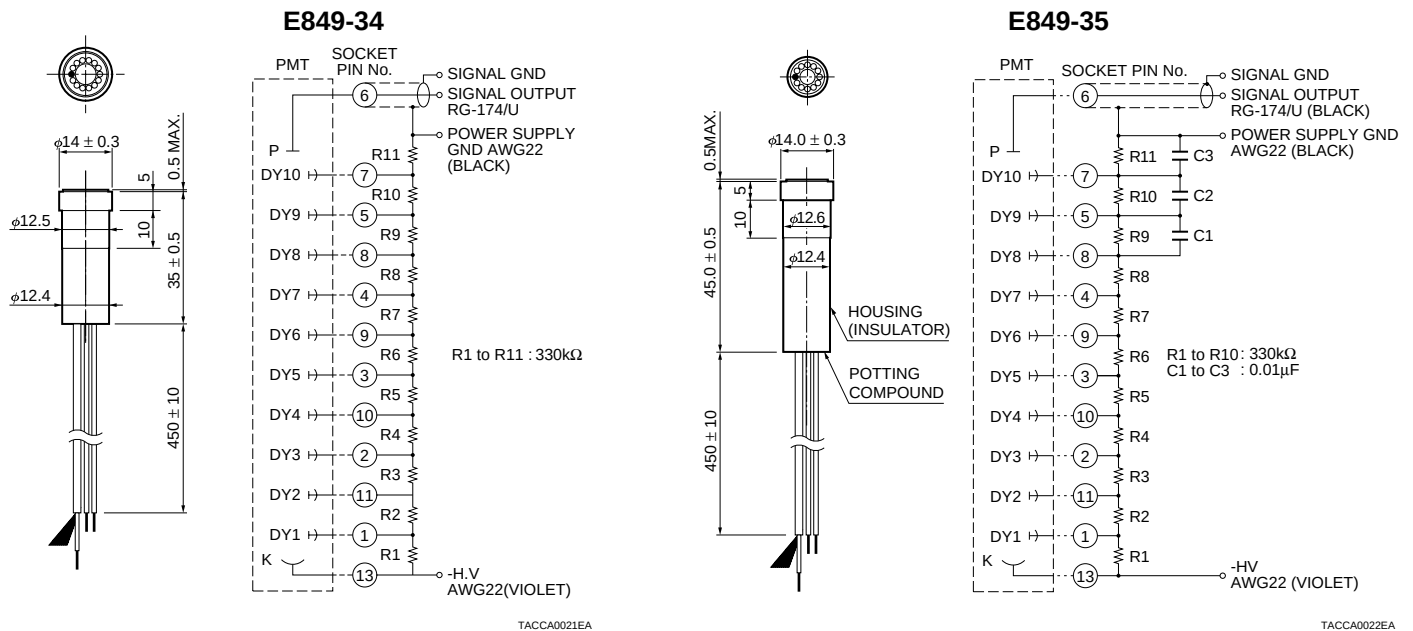


Figure 8: Optional Socket Assembly E849-34 and E849-35 (Unit: mm)

The E849-34 and E849-35 are socket assemblies specifically designed for 1/2 inch diameter, 10 stage, head-on type photomultiplier tubes having a 13-pin glass base. It contains a voltage-divider network potted with silicone rubber, thus eliminating troublesome soldering for making up the divider network.



**Warning - Personal Safety Hazards**  
 Electrical Shock — Operating voltage applied to this device presents shock hazard.

## HAMAMATSU

HAMAMATSU PHOTONICS K.K., Electron Tube Center

314-5, Shimokanzo, Toyooka-village, Iwata-gun, Shizuoka-ken, 438-0193, Japan, Telephone: (81)539/62-5248, Fax: (81)539/62-2205

U.S.A.: Hamamatsu Corporation, 360 Foothill Road, P. O. Box 6910, Bridgewater, N.J. 08807-0910, U.S.A., Telephone: (1)908-231-0960, Fax: (1)908-231-1218

Germany: Hamamatsu Photonics Deutschland GmbH: Arzbergerstr. 10, D-82211 Herrsching am Ammersee, Germany, Telephone: (49)8152-375-0, Fax: (49)8152-2658

France: Hamamatsu Photonics France S.A.R.L.: 8, 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

United Kingdom: Hamamatsu Photonics UK Limited: Lough Point, 2 Gladbeck Way, Windmill Hill, Enfield, Middlesex EN2 7JA, United Kingdom, Telephone: (44)181-367-3560, Fax: (44)181-367-6384

North Europe: Hamamatsu Photonics Norden AB: Färögatan 7, S-164-40 Kista Sweden, Telephone: (46)8-703-29-50, Fax: (46)8-750-58-95

Italy: Hamamatsu Photonics Italia: S.R.L.: Strada della Moia, 1/E, 20020 Arese, (Milano), Italy, Telephone: (39)02-935 81 733, Fax: (39)02-935 81 741

TPMH1216E01  
 AUG. 1998