

## FEATURES

- Fast time response
- Suitable for mass production

## APPLICATIONS

- TOF-PET in nuclear medicine
- TOF counter in HEP experiment
- Radiation monitor in security instrument



From left: R13478, R13449, R13408, R13089

Figure 1: Typical spectral response

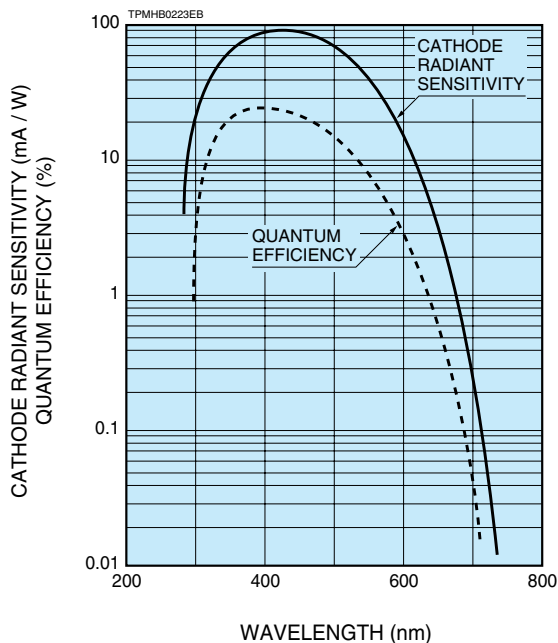
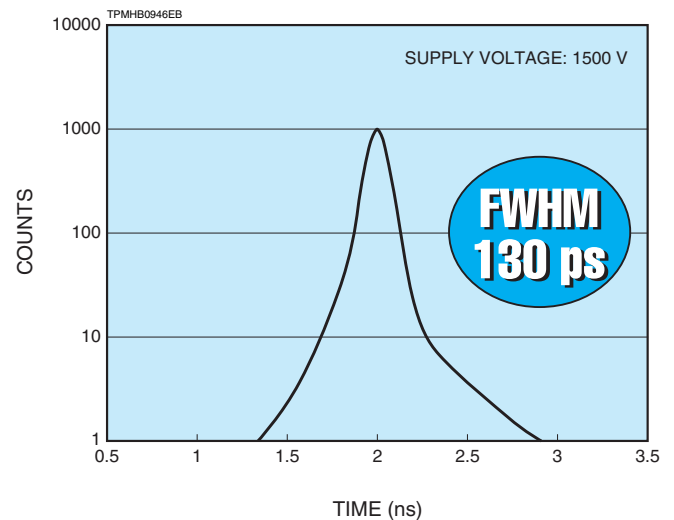


Figure 2: T.T.S. (R13478)



# PHOTOMULTIPLIER TUBES

## R13478, R13449, R13408, R13089

| Type No. | Spectral response |                 | Photo-cathode material | Window material | Dynode structure / Stages | Maximum ratings                          |                       | Anode to cathode supply voltage | Cathode characteristics |         |                                       |         |
|----------|-------------------|-----------------|------------------------|-----------------|---------------------------|------------------------------------------|-----------------------|---------------------------------|-------------------------|---------|---------------------------------------|---------|
|          | Range             | Peak wavelength |                        |                 |                           | Supply voltage between anode and cathode | Average anode current |                                 | Luminous                |         | Blue sensitivity index (CS 5-58) Typ. | Radiant |
|          |                   |                 |                        |                 |                           |                                          |                       |                                 | Min.                    | Typ.    |                                       |         |
|          | (nm)              | (nm)            |                        |                 |                           | (V)                                      | (mA)                  | (V)                             | (μA/lm)                 | (μA/lm) |                                       | (mA/W)  |
| R13478   | 300 to 650        | 420             | BA                     | K               | L/8                       | 1750                                     | 0.1                   | 1500                            | 70                      | 95      | 10.0                                  | 80      |
| R13449   | 300 to 650        | 420             | BA                     | K               | L/8                       | 1750                                     | 0.1                   | 1500                            | 70                      | 95      | 10.0                                  | 80      |
| R13408   | 300 to 650        | 420             | BA                     | K               | L/8                       | 1750                                     | 0.1                   | 1500                            | 70                      | 95      | 10.0                                  | 80      |
| R13089   | 300 to 650        | 420             | BA                     | K               | L/8                       | 1750                                     | 0.1                   | 1500                            | 70                      | 95      | 10.0                                  | 80      |

NOTE: Ⓐ BA: Bialkali    Ⓑ K: Borosilicate glass    Ⓒ L: Linear-focused  
Ⓓ Measured at the peak sensitivity wavelength.

### VOLTAGE DISTRIBUTION RATIO AND SUPPLY VOLTAGE

| Electrodes | K   | G   | Dy1 | Dy2 | Dy3 | Dy4 | Dy5 | Dy6 | Dy7 | Dy8(Acc) | P |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|----------|---|
| Ratio      | 1.3 | 4.8 | 1.5 | 1.5 | 1   | 1   | 1   | 1   | 1   | 1        |   |

Supply voltage: 1500 V, K: Cathode, Dy: Dynode, P: Anode, G: Grid, Acc: Accelerating electrode  
Acc to be connected to Dy8 with a protection resistor in series. (recommended resistance: 10 MΩ)

Figure 3: Typical gain characteristics

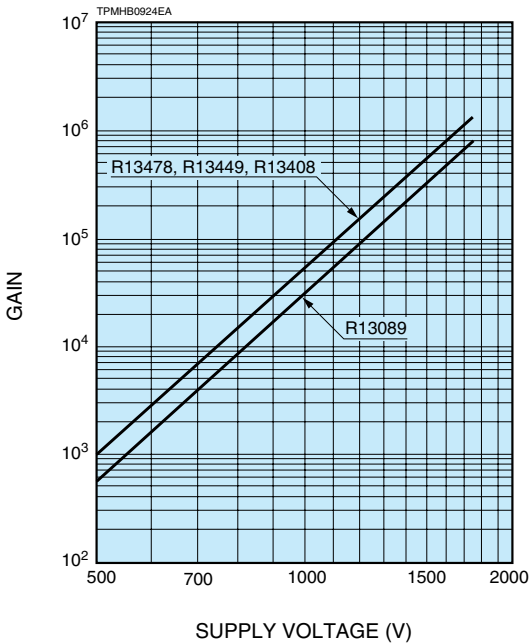
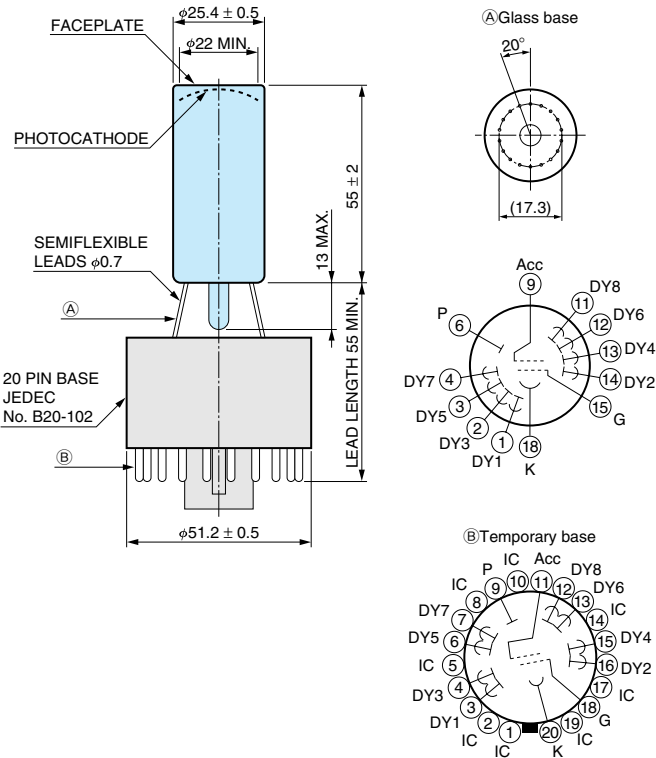


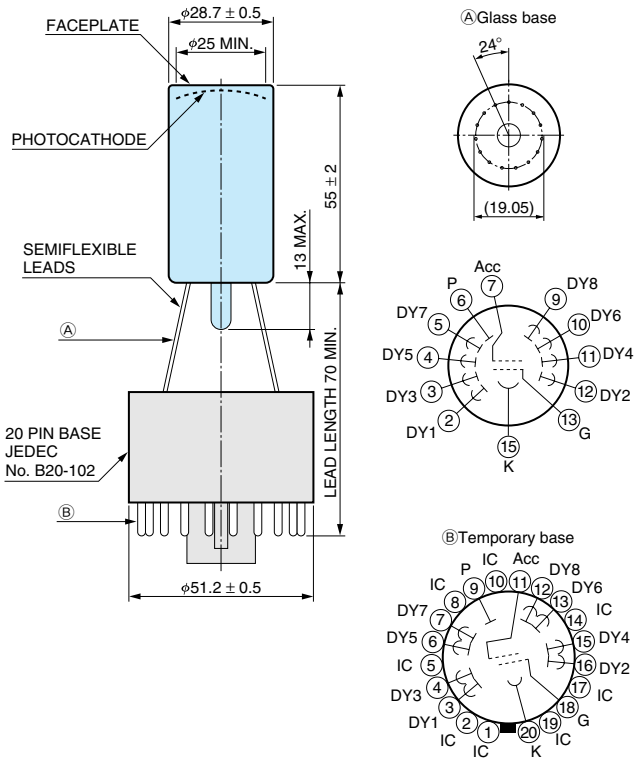
Figure 4: Dimensional outline and basing diagram (Unit: mm)

#### ● R13478

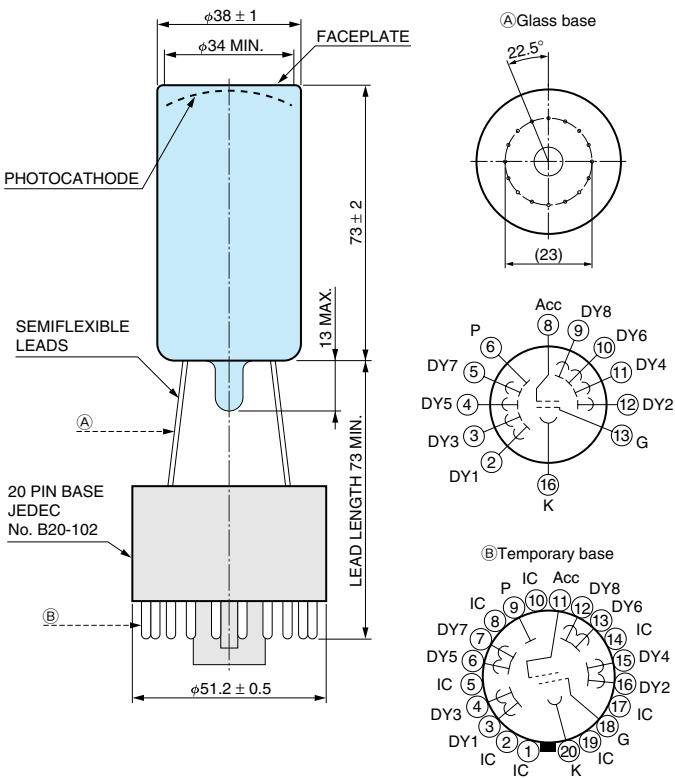


| Anode characteristics |                       |                       |                             |           |               |           |                                     | Pulse linearity |                | Storage temperature | Operating ambient temperature | Type No. |
|-----------------------|-----------------------|-----------------------|-----------------------------|-----------|---------------|-----------|-------------------------------------|-----------------|----------------|---------------------|-------------------------------|----------|
| Luminous              | Radiant               | Gain                  | Dark current (After 30 min) |           | Time response |           |                                     |                 |                |                     |                               |          |
|                       |                       |                       | Typ.                        | Max.      | Typ.          | Typ.      | T.T.S. (Transit Time Spread) (FWHM) | ±2 % deviation  | ±5 % deviation |                     |                               |          |
| Typ. (A/lm)           | Typ. (A/W)            | Typ.                  | Typ. (nA)                   | Max. (nA) | Typ. (ns)     | Typ. (ns) | (ps)                                | (mA)            | (mA)           | (°C)                | (°C)                          |          |
| 50                    | 4.2 × 10 <sup>4</sup> | 5.3 × 10 <sup>5</sup> | 3                           | 30        | 0.9           | 9.1       | 130                                 | 10              | 25             | -80 to +50          | -30 to +50                    | R13478   |
| 50                    | 4.2 × 10 <sup>4</sup> | 5.3 × 10 <sup>5</sup> | 3                           | 30        | 0.9           | 10        | 170                                 | 10              | 30             | -80 to +50          | -30 to +50                    | R13449   |
| 50                    | 4.2 × 10 <sup>4</sup> | 5.3 × 10 <sup>5</sup> | 3                           | 30        | 1.2           | 13        | 190                                 | 20              | 50             | -80 to +50          | -30 to +50                    | R13408   |
| 30                    | 2.5 × 10 <sup>4</sup> | 3.2 × 10 <sup>5</sup> | 10                          | 50        | 2.0           | 20        | 230                                 | 30              | 60             | -80 to +50          | -30 to +50                    | R13089   |

● R13449



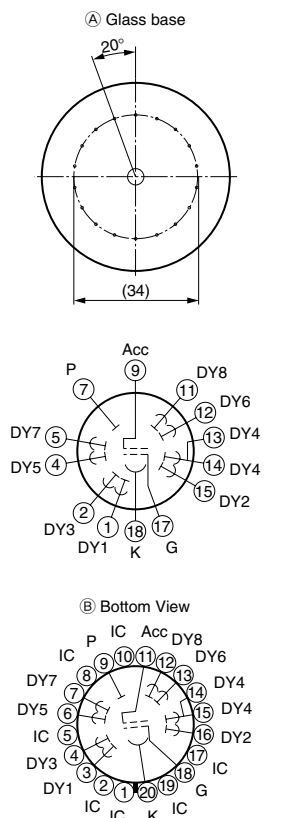
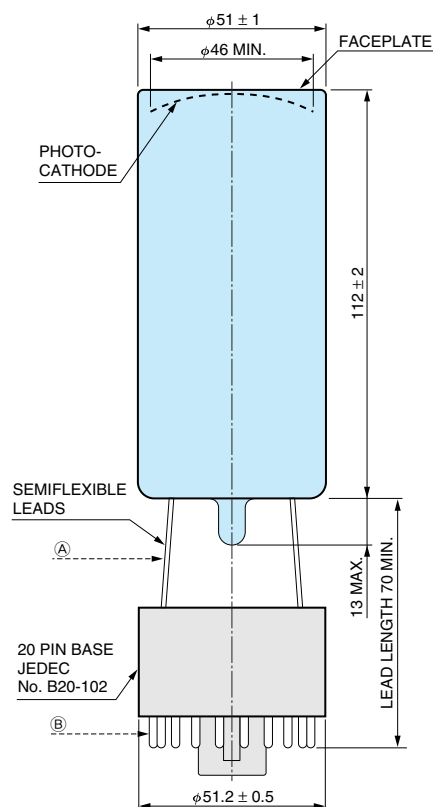
● R13408



# PHOTOMULTIPLIER TUBES

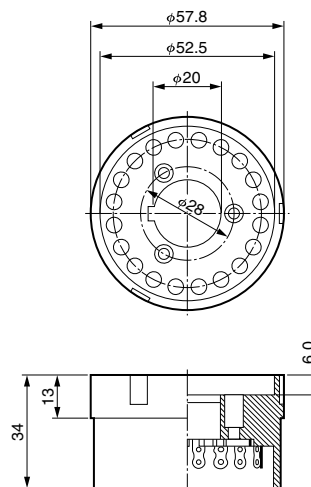
## R13478, R13449, R13408, R13089

### ● R13089



TPMHA0606EA

### ● Socket E678-20B (Supplied)



TACCA0309EA

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**HAMAMATSU PHOTONICS K.K., Electron Tube Division**

**314-5, Shimokanzo, Iwata City, Shizuoka Pref., 438-0193, Japan, Telephone: (81)539/62-5248, Fax: (81)539/62-2205**

**U.S.A.:** Hamamatsu Corporation: 360 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](mailto:usa@hamamatsu.com)

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

**United Kingdom:** Hamamatsu Photonics UK Limited: 2 Howard Court, 10 Tewin Road, Welwyn Garden City, Hertfordshire AL7 1BW, United Kingdom, Telephone: (44)1707-294888, Fax: (44)1707-325777 E-mail: [info@hamamatsu.co.uk](mailto:info@hamamatsu.co.uk)

**North Europe:** Hamamatsu Photonics Norden AB: Torshamnsgatan 35 SE-164 40 Kista, Sweden, Telephone: (46)8-509-031-00, Fax: (46)8-509-031-01 E-mail: [info@hamamatsu.se](mailto:info@hamamatsu.se)

**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](mailto:info@hamamatsu.it)

**China:** Hamamatsu Photonics (China) Co., Ltd.: B1201 Jiaming Center, No.27 Dongsanhuan Beilu, Chaoyang District, Beijing 100020, China, Telephone: (86)10-6586-6006, Fax: (86)10-6586-2866 E-mail: [hpc@hamamatsu.com.cn](mailto:hpc@hamamatsu.com.cn)

**Taiwan:** Hamamatsu Photonics Taiwan Co., Ltd.: 8F-3, No.158, Section2, Gongdao 5th Road, East District, Hsinchu, 300, Taiwan R.O.C. Telephone: (886)03-659-0080, Fax: (886)07-811-7238 E-mail: [info@tw.hpk.co.jp](mailto:info@tw.hpk.co.jp)

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