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# PHOTOMULTIPLIER TUBES
# R8486, R8487

**For vacuum ultraviolet light detection**
**Cs-Te (R8486), Cs-I (R8487) photocathode, $MgF_2$ window,**
**28 mm (1-1/8 inch) diameter, 9-stage, Side-on type**

## FEATURES

- **Sensitivity in the vacuum ultraviolet region**
  - **R8486.....115 to 320 nm**
  - **R8487.....115 to 195 nm**
- **High quantum efficiency (at 122 nm)**
  - **R8486.....22.5 % (Typ.)**
  - **R8487.....26.0 % (Typ.)**
- **High anode sensitivity**
  - **R8486 (at 254 nm).....$5.2 \times 10^5$ A/W (Typ.)**
  - **R8487 (at 122 nm).....$1.0 \times 10^5$ A/W (Typ.)**



## APPLICATIONS

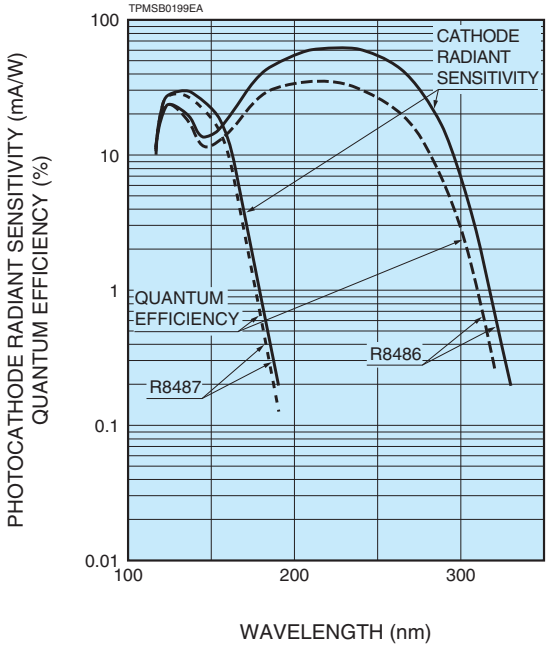
- **Emission spectroscopy, etc.**

## SPECIFICATIONS

### GENERAL

| Parameter | | R8486 | R8487 | Unit |
|---|---|---|---|---|
| Spectral response | | 115 to 320 | 115 to 195 | nm |
| Wavelength of maximum response | | 200 | 130 | nm |
| Photocathode material | | Cs-Te | Cs-I | — |
| Window material | | $MgF_2$ | | — |
| Minimum effective area | | 8 × 12 | | mm |
| Dynode | Structure | Circular-cage | | — |
| | Number of stage | 9 | | — |
| | Material | Sb-Cs | | — |
| Direct interelectrode capacitances | Anode to dynode No.9 | Approx. 4 | | pF |
| | Anode to all other electrodes | Approx. 6 | | pF |
| Base | | 11-pin base JEDEC No. B11-88 | | — |
| Weight | | 45 | | g |
| Suitable socket | | E678-11A (sold separately) | | — |
| Operating ambient temperature | | -30 to +50 | | °C |
| Storage temperature | | -30 to +50 | | °C |

Figure 1: Typical spectral response




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## MAXIMUM RATINGS (Absolute maximum values)

| Parameter | Rating | Unit |
|---|---|---|
| Supply voltage | | |
| Between anode and cathode | 1250 | V |
| Between anode and last dynode | 250 | V |
| Average anode current Ⓐ | 0.1 | mA |

## CHARACTERISTICS (at 25 °C)

| Parameter | R8486 | R8487 | Unit |
|---|---|---|---|
| Cathode sensitivity | | | |
| Quantum efficiency at 122 nm | 22.5 | 26.0 | % |
| at 254 nm | 25.0 | — | % |
| Anode sensitivity Ⓑ | | | |
| Radiant at 122 nm | — | $1.0 \times 10^5$ | A/W |
| at 254 nm | $5.2 \times 10^5$ | — | A/W |
| Gain | $1.0 \times 10^7$ | $3.9 \times 10^6$ | — |
| Anode dark current (After 30 minute storage in darkness) Ⓑ | 1.0 | 0.1 | nA |
| ENI (Equivalent Noise Input) Ⓒ at 122 nm | — | $1.12 \times 10^{-16}$ | W |
| at 254 nm | $1.09 \times 10^{-16}$ | — | W |
| Time response | | | |
| Anode pulse rise time Ⓓ | 2.2 | 2.2 | ns |
| Electron transit time Ⓔ | 22 | 22 | ns |
| Transit time spread Ⓕ | 1.2 | 1.2 | ns |

**NOTES**

Ⓐ: Averaged over any interval of 30 seconds maximum.

Ⓑ: Measured with the voltage distribution ratio shown in Table 1 below.

Table 1: Voltage distribution ratio

| Electrode | K | Dy1 | Dy2 | Dy3 | Dy4 | Dy5 | Dy6 | Dy7 | Dy8 | Dy9 | P |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Distribution ratio | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |

Supply voltage=1000 V

K: Cathode Dy: Dynode P: Anode

Ⓒ: ENI is an indication of the photon-limited signal-to-noise ratio. It refers to the amount of light in watts to produce a signal-to-noise ratio of unity in the output of a photomultiplier tube.

$$ENI = \frac{\sqrt{2q \cdot Idb \cdot g \cdot \Delta f}}{S}$$

where q = Electronic charge ($1.60 \times 10^{-19}$ coulomb).
Idb = Anode dark current in amperes after 30 minutes storage in darkness.
g = Gain.
Δf = Bandwidth of the system in hertz.
S = Anode radiant sensitivity in amperes per watt at the wavelength of interest.

Ⓓ: 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.

Ⓔ: The electron transit time is the interval between the arrival of delta function light pulse at the entrance window of the tube and the time when the anode output reaches the peak amplitude. In measurement, the whole photocathode is illuminated.

Ⓕ: Also called transit time jitter. This is the fluctuation in electron transit time between individual pulses in the signal photoelectron mode, and may be defined as the FWHM of the frequency distribution of electron transit times.

Figure 2: Typical gain and anode radiant sensitivity

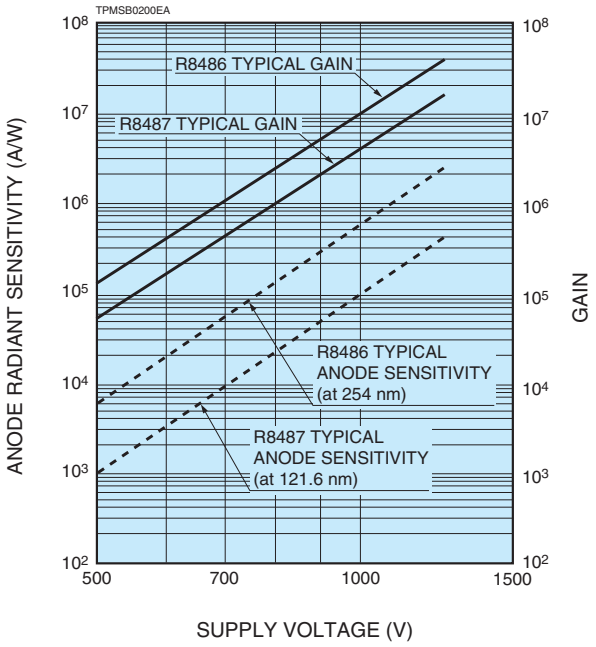



Figure 3: Typical time response

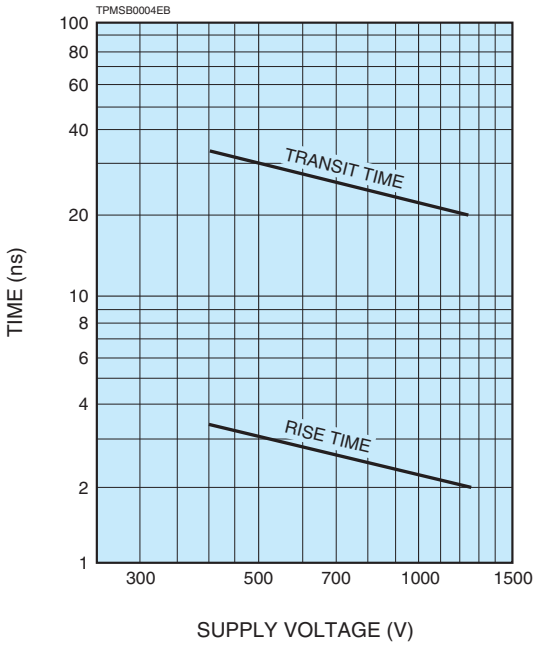



Figure 4: Dimensional outline and basing diagram (Unit: mm)

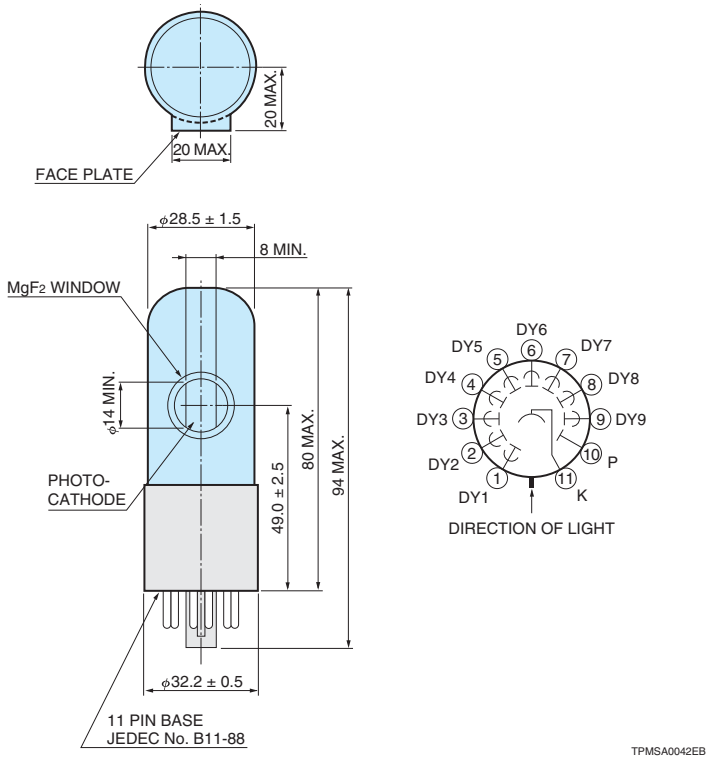
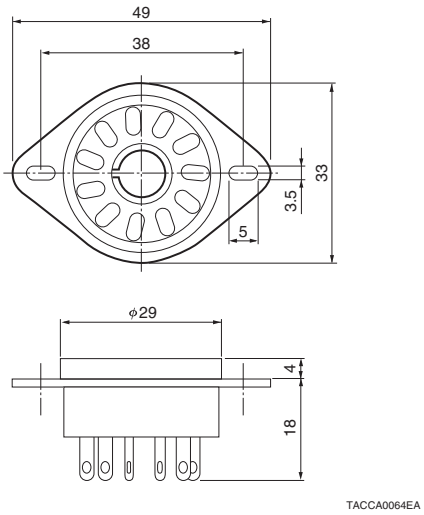



Figure 5: Socket E678-11A (Sold separately) (Unit: mm)




**NOTE:** There is a 2 mm diameter hole to exhaust inner air on the plastic base.

**Warning—Personal safety hazards**

Electrical shock—Operating voltages applies to this device present a shock hazard.

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