HAMAMATSU

PRELIMINARY DATA
SEPT. 2003

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 121.6 nm)**
  - **R8486.....22.5 % (Typ.)**
  - **R8487.....26.0 % (Typ.)**
- **High Anode Sensitivity**
  - **R8486 (at 254 nm).....5.2×10^5 A/W (Typ.)**
  - **R8487 (at 121.6 nm).....1.0×10^5 A/W (Typ.)**

PMSF0093

APPLICATIONS

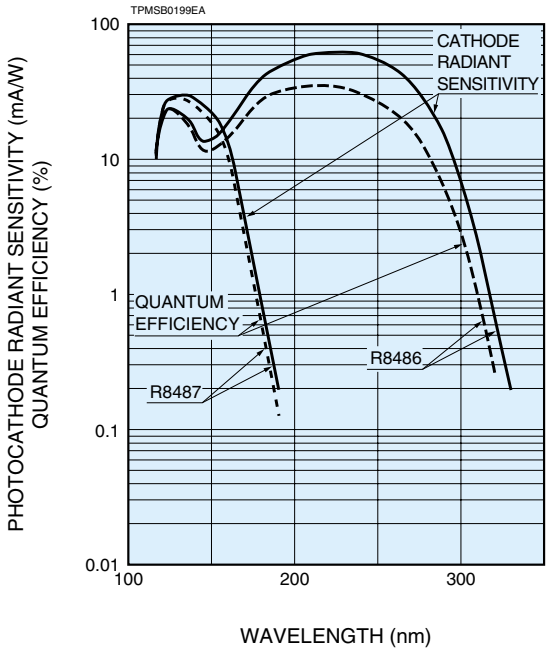
- **Emission Spectroscopy, etc.**

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



MAXIMUM RATINGS (Absolute Maximum Values)

Parameter	Rating	Unit
Supply Voltage		
Between Anode and Cathode	1250	V
Between Anode and Last Dynode	250	V
Between Successive Dynodes	250	V
Between First Dynode and Cathode	250	V
Average Anode Current Ⓐ	0.1	V

CHARACTERISTICS (at 25 °C)

Parameter	R8486	R8487	Unit
Cathode Sensitivity			
Quantum Efficiency at 121 nm	22.5	26.0	%
at 254 nm	25.0	—	%
Anode Sensitivity Ⓑ			
Radiant at 121 nm	—	1.0×10^5	A/W
at 254 nm	5.2×10^5	—	A/W
Gain	1.0×10^7	3.9×10^6	—
Anode Dark Current (After 30 minute storage in darkness) Ⓒ	1.0	0.1	nA
ENI (Equivalent Noise Input) Ⓓ at 121 nm	—	1.12×10^{-16}	W
at 254 nm	1.09×10^{-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 same light source as Note B and 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

Ⓒ: Measured with the same supply voltage and voltage distribution ratio as Note E after removal of light.

Ⓓ: 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 (1.60×10^{-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

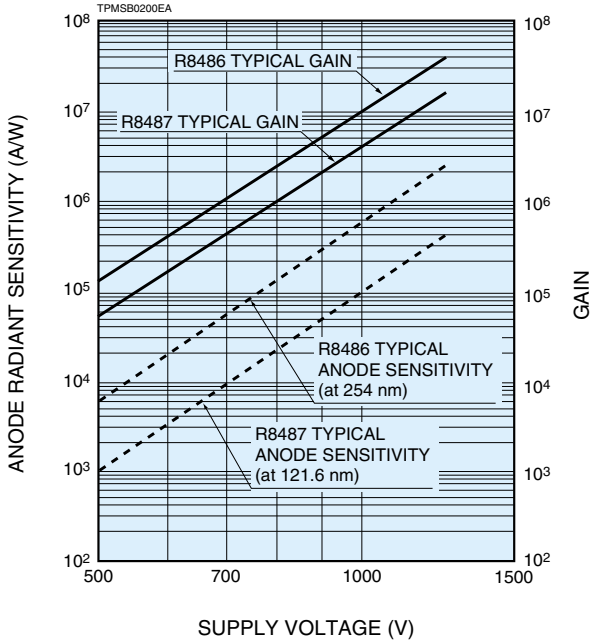


Figure 3: Typical Time Response

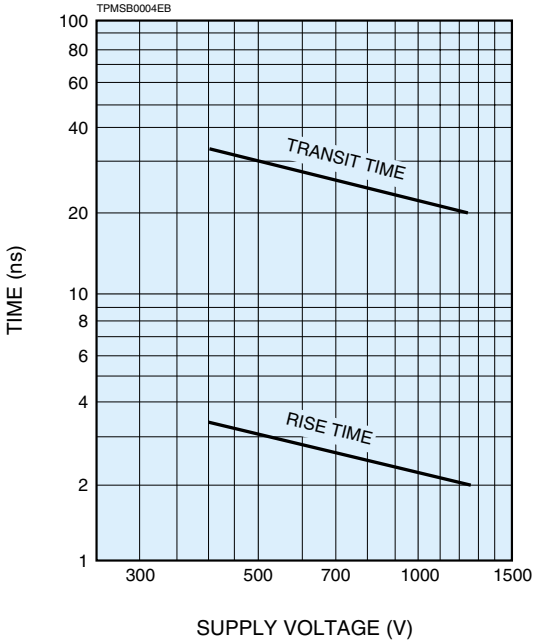


Figure 4: Dimensional Outline and Basing Diagram (Unit: mm)

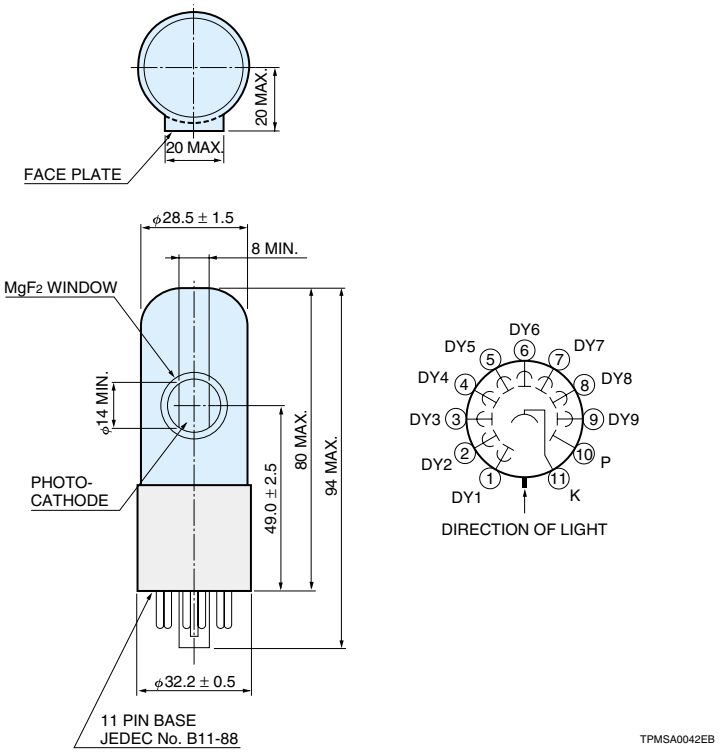
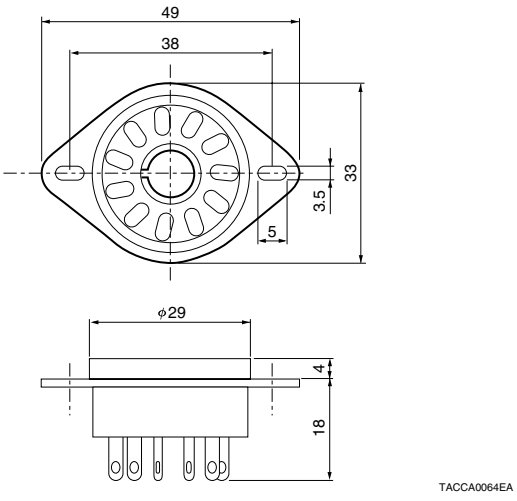


Figure 5: Socket E678-11A (Sold Separately) (Unit: mm)



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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