HAMAMATSU

PHOTOMULTIPLIER TUBE
R10454

For Vacuum Ultraviolet Light Detection, Cs-I Photocathode, MgF_2 Window, 28 mm (1-1/8 Inch) Diameter, 9-stage, Side-on Type Excellent Solar Blind Spectral Response

FEATURES

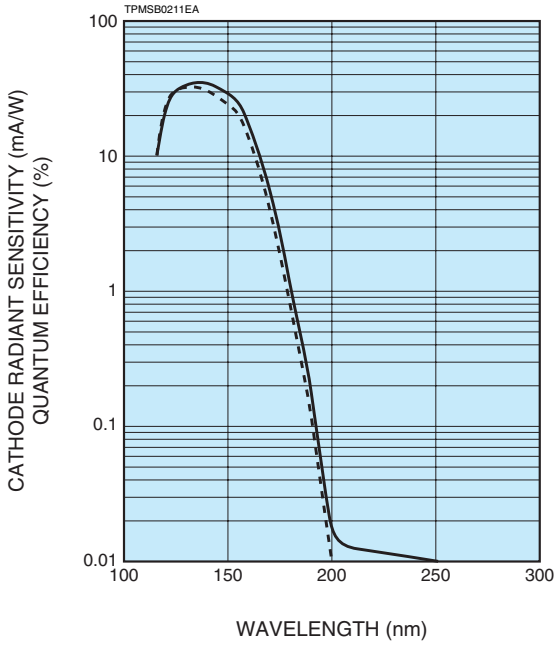
- **High Quantum Efficiency (at 121 nm) ..... 26.0 % (Typ.)**
- **High Anode Sensitivity (at 121 nm) ..... 1.0×10^5 A/W (Typ.)**
- **Excellent Solar Blind Spectral Response (Anode Sensitivity Ratio)**
  - **121.6 nm/200 nm ..... 2800 (Typ.)**
  - **121.6 nm/250 nm ..... 5500 (Typ.)**
  - **121.6 nm/300 nm ..... 8500 (Typ.)**

PMSF0093

APPLICATIONS

- **Atomic Emission Spectrophotometer**
- **Plasma Emission Spectrophotometer**
- **VUV-UV Spectrophotometer**

Figure 1: Typical Spectral Response



SPECIFICATIONS

GENERAL

Parameter		Description / Value	Unit
Spectral Response		115 to 195	nm
Wavelength of Maximum Response		130	nm
Photocathode Material		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
Operating Ambient Temperature		-30 to +50	°C
Storage Temperature		-30 to +50	°C
Suitable Socket for Base (sold separately)		E678-11A	—

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	mA

CHARACTERISTICS (at 25 °C)

Parameter			Value	Unit
Cathode Sensitivity	Radiant Sensitivity at 121 nm	Typ.	25.5	mA/W
	Quantum Efficiency at 121 nm	Typ.	26	%
	Quantum Efficiency at 133 nm (Peak)	Typ.	32.4	%
Anode Radiant Sensitivity at 121 nm Ⓑ		Typ.	1.0×10^5	A/W
Gain at 1000 V		Typ.	3.9×10^6	—
Anode Dark Current (After 30 minutes storage in darkness) Ⓒ			0.1	nA
ENI (Equivalent Noise Input) at 121 nm Ⓓ			1.12×10^{-16}	W
Time Response	Anode Pulse Rise Time Ⓔ		2.2	ns
	Electron Transit Time Ⓕ		22	ns
	Transit Time Spread Ⓖ		1.2	ns
Anode Sensitivity Ratio	121 nm / 200 nm	Typ.	2800	—
	121 nm / 250 nm	Typ.	5500	—
	121 nm / 300 nm	Typ.	8500	—

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

Ⓒ: Measured with the same supply voltage and voltage distribution ratio as Note B 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 (after 30 minutes storage) in amperes.
g = Gain.
Δf = Bandwidth of the system in hertz. 1 hertz is used.
S = Anode radiant sensitivity in amperes per watt at the wavelength of peak response.

Ⓔ: 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 Spectral Response

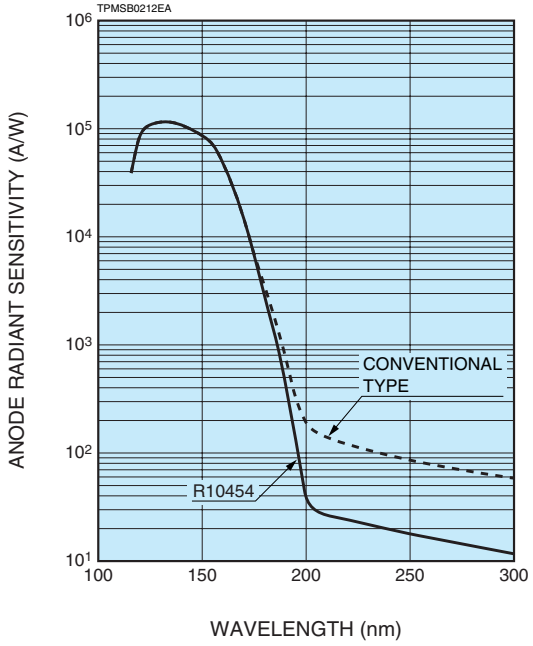


Figure 3: Typical Gain and Anode Radiant Sensitivity

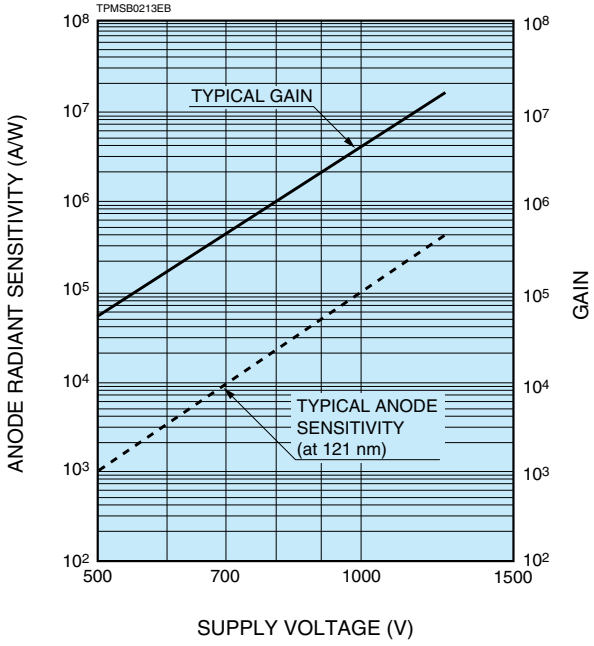


Figure 4: Typical Time Response

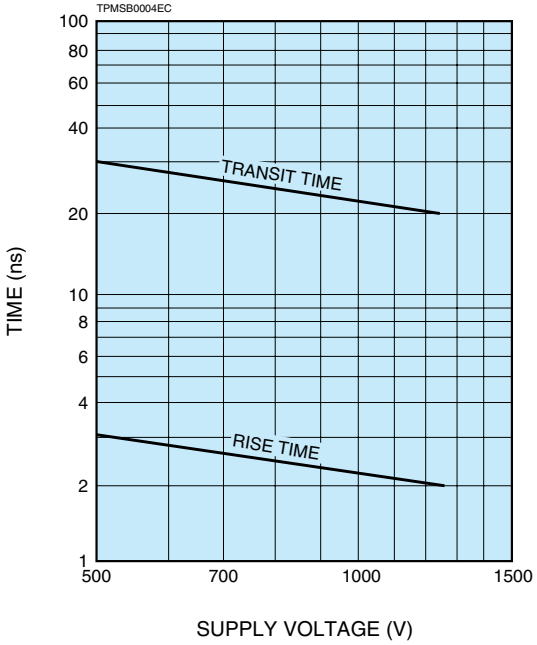


Figure 5: Dimensional Outline and Basing Diagram (Unit: mm)

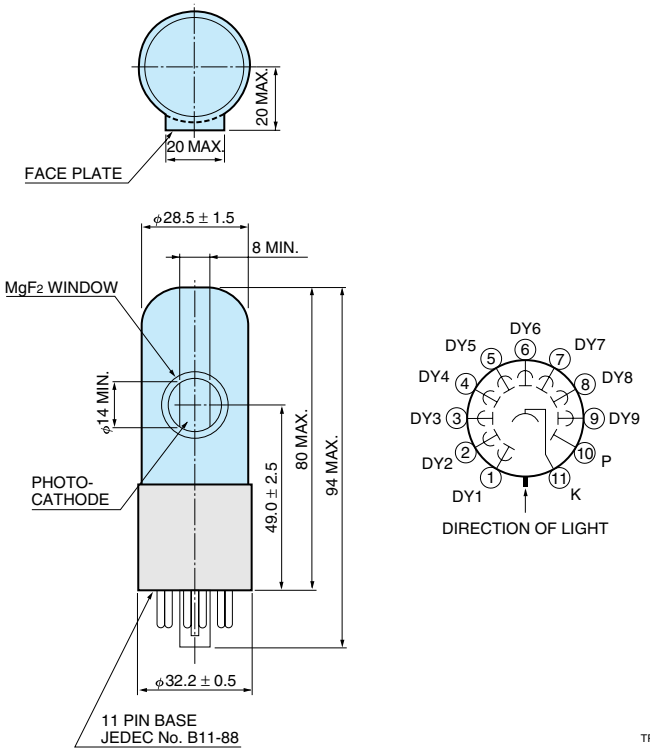
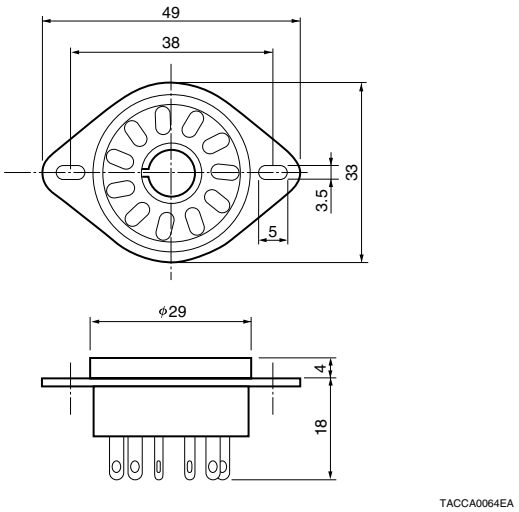


Figure 6: Socket E678-11A (Sold Separately) (Unit: mm)



* E678-11A cannot be used in the vacuum.

NOTE: There is a 2 mm diameter hole to exhaust inner air on the plastic base. Dedicated vacuum flanges are provided for operation in vacuum.

Handling precautions

- Operate below 10^{-1} Pa condition or atmospheric pressure.

Warning—Personal Safety Hazards
Electrical Shock—Operating voltages applies to this device present a shock hazard.

HAMAMATSU WEB SITE www.hamamatsu.com
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, P. O. Box 6910, 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: Arzbergerstr. 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
United Kingdom: Hamamatsu Photonics UK Limited: 2 Howard Court, 10 Tewin Road Welwyn Garden City Hertfordshire AL7 1BW, United Kingdom, Telephone: 44-(0)1707-294888, Fax: 44(0)1707-325777 E-mail: info@hamamatsu.co.uk
North Europe: Hamamatsu Photonics Norden AB: Smidesvägen 12, SE-171-41 SOLNA, Sweden, Telephone: (46)8-509-031-00, Fax: (46)8-509-031-01 E-mail: info@hamamatsu.se
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 E-mail: info@hamamatsu.it

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