HAMAMATSU

PHOTON IS OUR BUSINESS

PHOTOMULTIPLIER TUBE
R9220

FEATURES

- **High cathode sensitivity**
  - **Luminous ..... 450 µA/lm (Typ.)**
  - **Radiant at 450 nm (peak) ..... 85 mA/W (Typ.)**
  - **Quantum efficiency at 260 nm (peak) .... 26.3 % (Typ.)**
- **High anode sensitivity**
  - **Luminous ..... 4500 A/lm (Typ.)**
  - **Radiant at 450 nm (peak) ..... 8.5 × 10^5 A/W (Typ.)**
- **Wide spectral response ..... 185 nm to 900 nm**
- **High signal to noise ratio**

APPLICATIONS

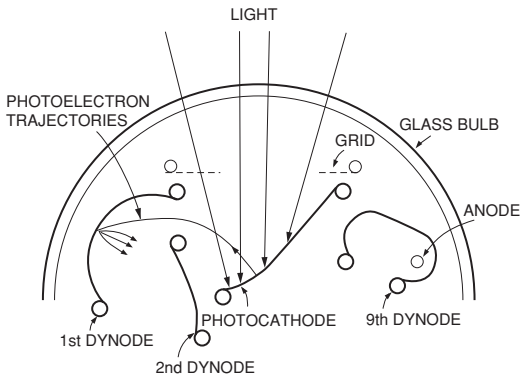
- **Bio fluorescence detection**
- **Laser scanning microscope**
- **Spectroscopy**
- **Environmental monitoring**
- **Fluorocytometer**
- **Pollen monitor**

SPECIFICATIONS

GENERAL

Parameter		Description / Value	Unit
Spectral response		185 to 900	nm
Wavelength of maximum response		450	nm
Photocathode	Material	Multialkali	—
	Minimum effective area	8 × 24	mm
Window material		UV glass	—
Dynode	Structure	Circular-cage	—
	Number of stages	9	—
Direct interelectrode capacitances	Anode to last dynode	4	pF
	Anode to all other electrodes	6	pF
Base		11-pin base	—
Weight		Approx. 45	g
Operating ambient temperature		-30 to +50	°C
Storage temperature		-30 to +50	°C
Suitable socket		E678–11A (sold separately)	—
Suitable socket assembly		E717–63 (sold separately)	—

Figure 1: Electro optical structure



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MAXIMUM RATINGS (Absolute maximum values)

Parameter		Value	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			Min.	Typ.	Max.	Unit
Cathode sensitivity	Quantum efficiency	at 260 nm	—	26.3	—	%
		at 450 nm	—	23.4	—	%
		at 633 nm	—	13.3	—	%
	Luminous Ⓑ		375	450	—	μA/lm
	Radiant	at 450 nm	—	85	—	mA/W
		at 633 nm	—	68	—	mA/W
	Red / White ratio Ⓒ		0.2	0.4	—	—
	Blue sensitivity index Ⓓ		—	12.5	—	—
Anode sensitivity	Luminous Ⓔ		1000	4500	—	A/lm
	Radiant at 450 nm (peak)			8.5×10^5		A/W
Gain Ⓔ			—	1.0×10^7	—	—
Anode dark current Ⓕ (After 30 min storage in darkness)			—	10	50	nA
Time response Ⓕ	Anode pulse rise time Ⓖ		—	2.2	—	ns
	Electron transit time Ⓗ		—	22	—	ns
	Transit time spread (TTS) Ⓘ		—	1.2	—	ns

NOTES

ⒶAveraged over any interval of 30 seconds maximum.

ⒷThe light source is a tungsten filament lamp operated at a distribution temperature of 2856 K. Supply voltage is 100 volts between the cathode and all other electrodes connected together as anode.

ⒸRed/White ratio is the quotient of the cathode current measured using a red filter interposed between the light source and the tube by the cathode current measured with the filter removed under the same conditions as Note Ⓑ.

ⒹThe value is cathode output current when a blue filter is interposed between the light source and the tube under the same condition as Note Ⓑ.

ⒺMeasured with the same light source as Note Ⓑ and with the voltage distribution ratio shown in Table 1 below.

Table 1: Voltage distribution ratio

Electrodes	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 shown in Table 1.

Ⓖ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 amplitube. 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 single photoelectron mode, and may be defined as the FWHM of the frequency distribution of electron transit times.

Figure 2: Typical spectral response

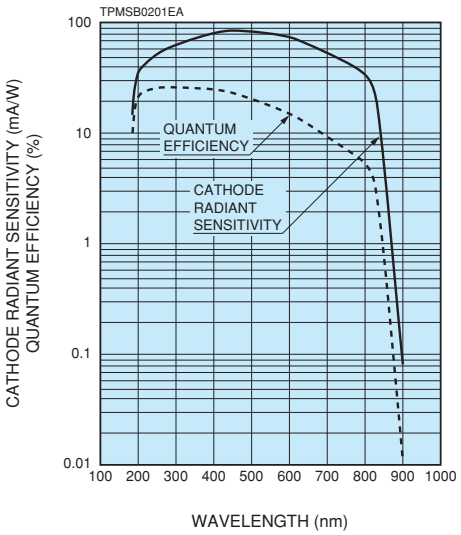


Figure 3: Typical temperature characteristics of dark current (at 1000 V, after 30 minute storage in darkness)

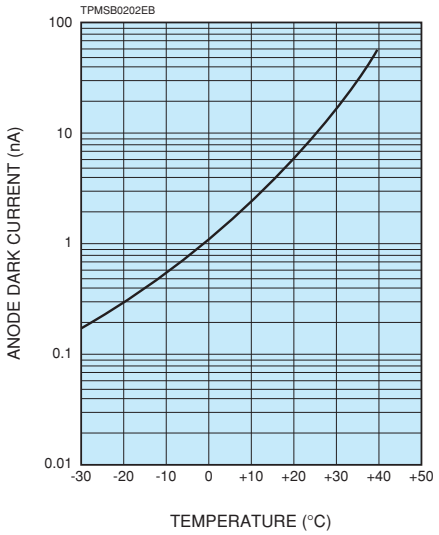


Figure 4: Anode luminous sensitivity and gain characteristics

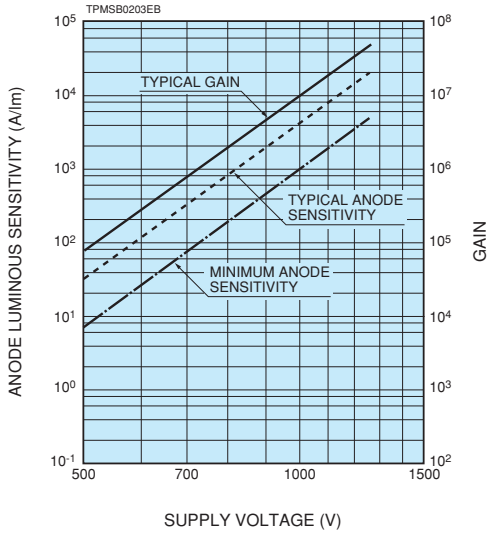


Figure 5: Typical time response

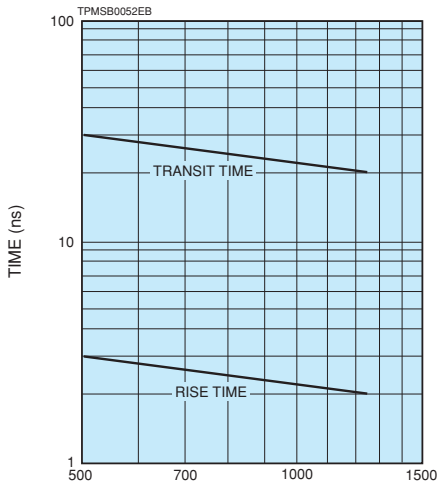


Figure 6: Typical temperature coefficient of anode sensitivity

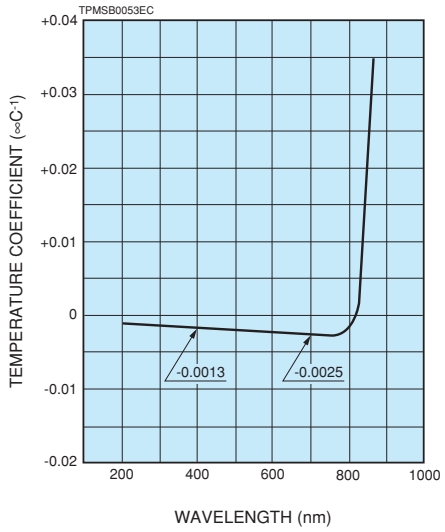


Figure 7: Dimensional outline and basing diagram (Unit: mm)

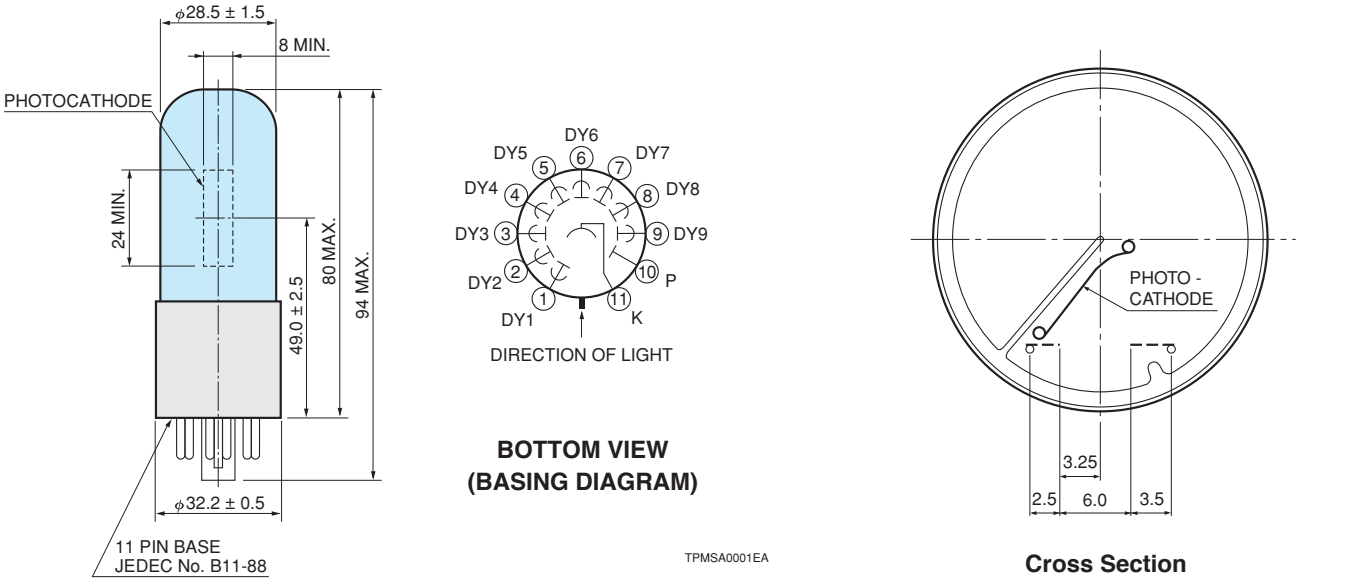


Figure 8: Socket (Unit: mm) Sold separately

E678-11A

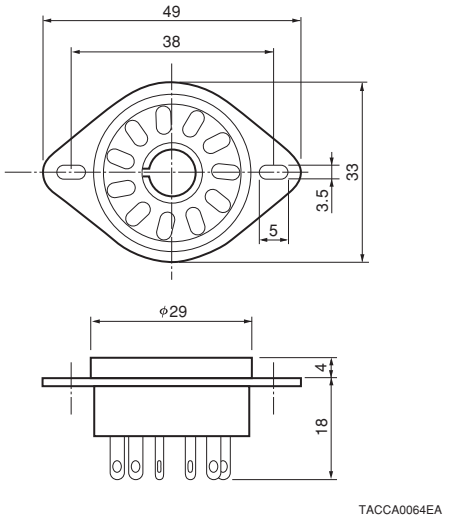
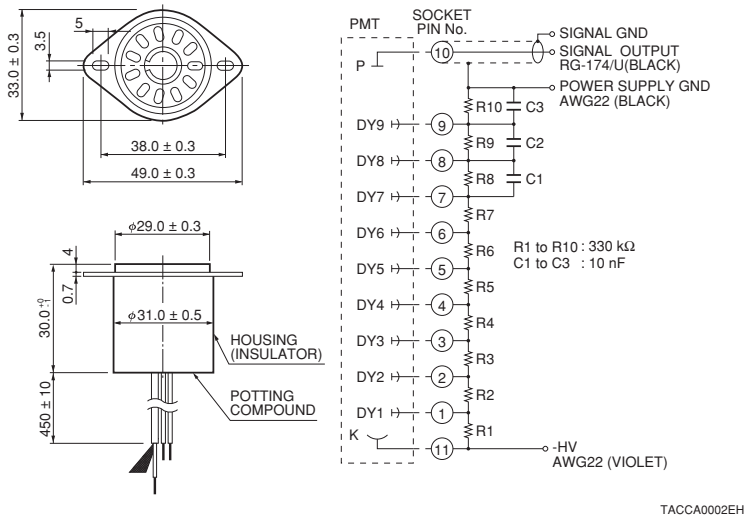


Figure 9: D-type socket assembly (Unit: mm) Sold separately

E717-63



* Hamamatsu also provides C13890 series compact high voltage power supplies and C12597-01, C8991 DP type socket assemblies which incorporate a DC to DC converter type high voltage power supply.

Warning–Personal Safety Hazards

Electrical Shock–Operating voltages applied to this device present a shock hazard.

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