

Quantum Efficiency: 40 % at 155 nm
High Sensitivity Solar Blind Photocathode (115 nm to 230 nm)
28 mm (1-1/8 Inch) Diameter, 9-Stage, Side-On Type

FEATURES

- Spectral Response 115 nm to 230 nm
- Cathode Sensitivity
Radiant at 155 nm 50 mA/W Typ.
Quantum Efficiency at 155 nm 40 %
- Anode Sensitivity (at 1000 V)
Radiant at 155 nm 1.5×10^5 A/W Typ.

APPLICATIONS

- Emission Spectroscopy
- VUV Spectrophotometer

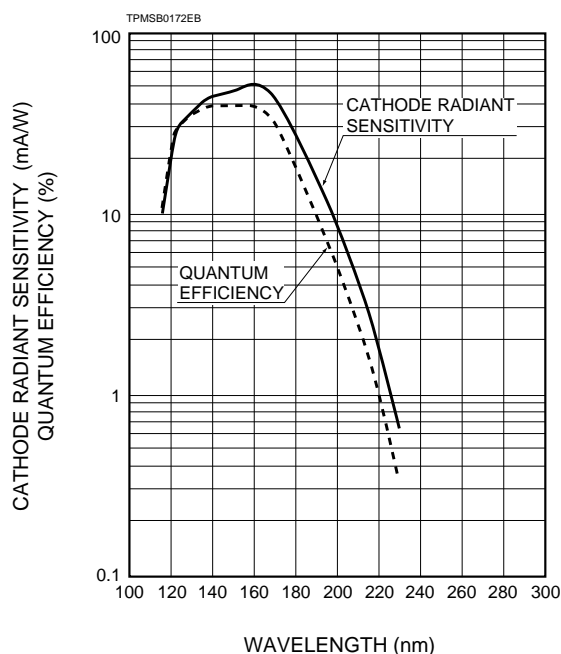


TPMSF0083

GENERAL

Parameter	Description/Value	Unit
Spectral Response	115 to 230	nm
Wavelength of Maximum Response	155	nm
Photocathode		
Material	Diamond	—
Minimum Effective Area	3×12	mm
Window Material	MgF ₂	—
Dynode		
Secondary Emitting Surface	Sb-Cs	—
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 JEDEC No.B11-88	
Weight	45	g
Suitable Socket	E678-11A(option)	—

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 dc
Between Anode and Last Dynode	250	V dc
Between Successive Dynodes	250	V dc
Between First Dynode and Cathode	250	V dc
Average Anode Current ^(A)	0.1	mA
Ambient Temperature	-30 to +50	°C

CHARACTERISTICS (at 25°C)

Parameter	Min.	Typ.	Max.	Unit
Cathode sensitivity				
Quantum Efficiency at 121.6 nm	10	26	—	%
at 155 nm	—	40	—	%
Radiant at 121.6 nm	10	26	—	mA/W
at 155 nm	—	50	—	mA/W
Anode Sensitivity				
Radiant at 155 nm	1.0×10^4	1.5×10^5	—	A/W
Gain	—	3.0×10^6	—	—
Anode Dark Current ^(C) (After 30 minutes storage in the darkness)	—	0.5	5	nA
ENI (Equivalent Noise Input) ^(D)	—	1.46×10^{-16}	—	W
Time Response ^(B)				
Anode Pulse Rise Time ^(E)	—	2.2	—	ns
Electron Transit Time ^(F)	—	22	—	ns
Transit Time Spread (TTS) ^(G)	—	1.2	—	ns
Anode Current Stability ^(H)				
Light Hysteresis	—	0.1	—	%
Voltage Hysteresis	—	1.0	—	%

NOTES

- (A): Averaged over any interval of 30 seconds maximum.
 (B): 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	1

Supply Voltage=1000 V dc

K: Cathode Dy: Dynode P: Anode

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

$$ENI = \frac{\sqrt{2q \cdot I_{db} \cdot G \cdot \Delta f}}{S}$$

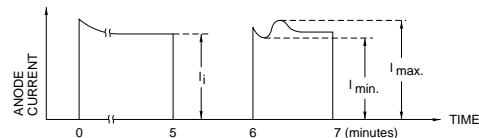
where q = Electronic charge (1.60×10^{-19} coulomb).
 I_{db} = Anode dark current(after 30 minutes storage) in amperes.
 G = Gain.
 Δf = Bandwidth of the system in hertz. 1 hertz is used.
 S = Anode radiant sensitivity in amperes per watt at the wavelength of peak response.

- (E): 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.

- (F): 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.

- (G): 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.

- (H): Hysteresis is temporary instability in anode current after light and voltage are applied.



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$$\text{Hysteresis} = \frac{I_{\max} - I_{\min}}{I_i} \times 100 (\%)$$

(1) Light Hysteresis

The tube is operated at 750 volts with an anode current of 1 micro-ampere for 5 minutes. The light is then removed from the tube for a minute. The tube is then re-illuminated by the previous light level for a minute to measure the variation.

(2) Voltage Hysteresis

The tube is operated at 300 volts with an anode current of 0.1 micro-ampere for 5 minutes. The light is then removed from the tube and the supply voltage is quickly increased to 800 volts. After a minute, the supply voltage is then reduced to the previous value and the tube is re-illuminated for a minute to measure the variation.

Figure 2: Typical Gain and Anode Radiant Sensitivity

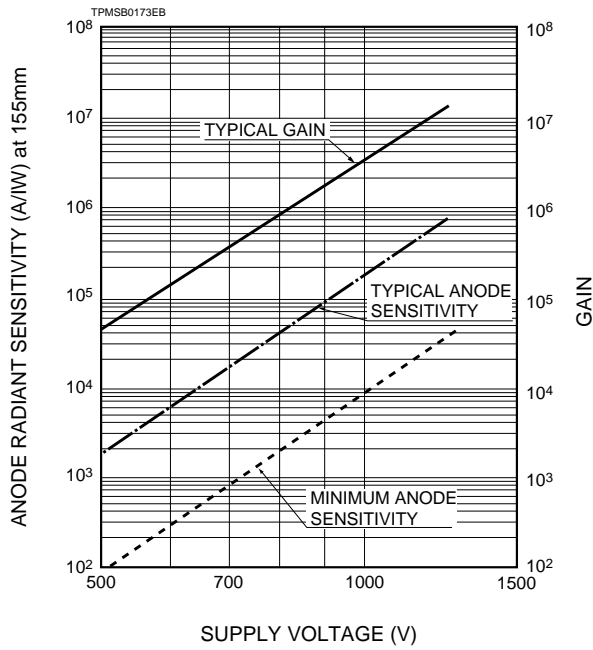


Figure 3: Typical Time Response

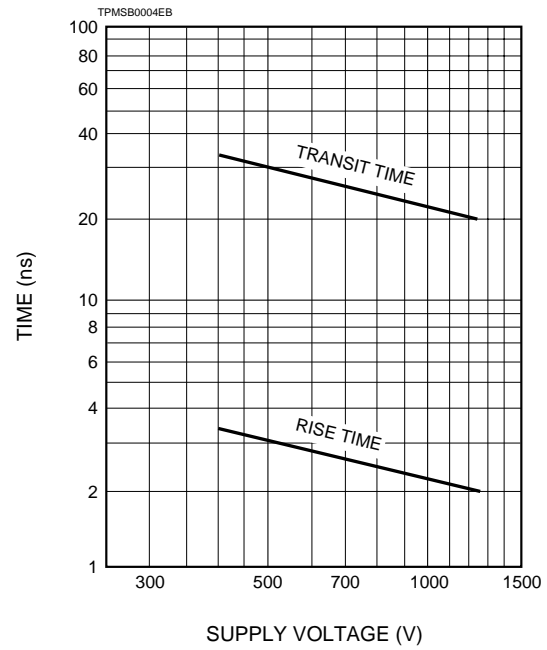


Figure 4: Dimensional Outline and Basing Diagram (Unit: mm)

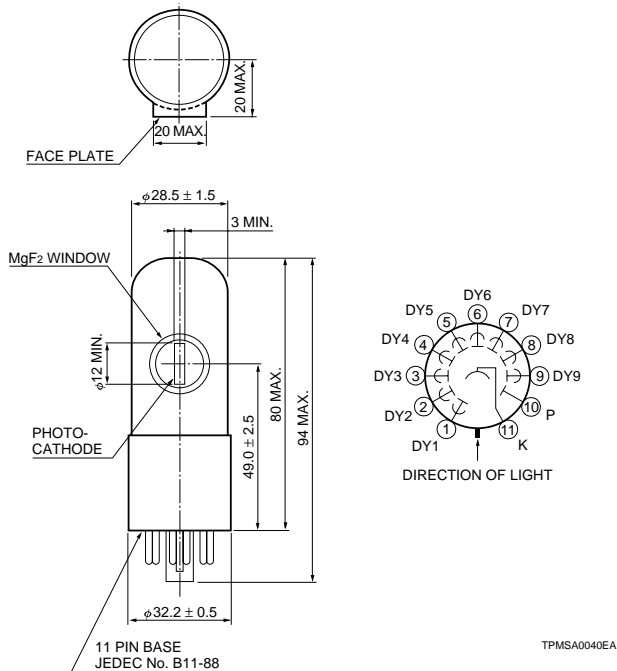
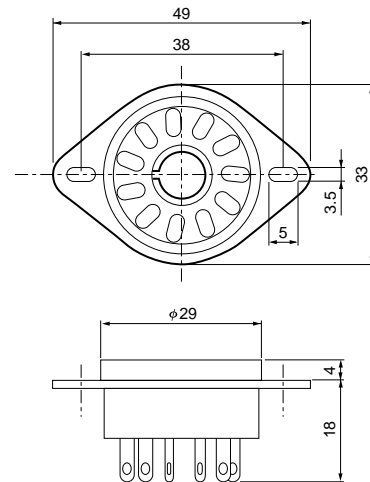


Figure 5: Socket E678-11A (Option) (Unit: mm)



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

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Warning—Personal Safety Hazards

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

HAMAMATSU

Homepage URL <http://www.hamamatsu.com>

HAMAMATSU PHOTONICS K.K., Electron Tube Center

314-5, Shimokanzo, Toyooka-village, Iwata-gun, Shizuoka-ken, 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.: 8, Rue du Saule Trappu, 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: france@hamamatsu.com

United Kingdom: Hamamatsu Photonics UK Limited: Lough Point, 2 Gladbeck Way, Windmill Hill, Enfield, Middlesex EN2 7JA, United Kingdom, Telephone: 44(20)8-367-3560, Fax: 44(20)8-367-6384 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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