

# HAMAMATSU

## FLAT PANEL TYPE MULTIANODE PHOTOMULTIPLIER TUBE ASSEMBLY H8500 SERIES

52 mm Square, Bialkali Photocathode, 12-stage,  
8 × 8 Multianode, Small Dead Space, Fast Time Response

### APPLICATIONS

- Small Animal Imaging
- Compact Gamma Camera
- Scinti-mammography
- 2D Radiation Monitor



Left: H8500C (HV cable input type), Right: H8500D (HV pin input type)

### SPECIFICATIONS

#### GENERAL

Parameter		H8500C	H8500D	H8500C-03	H8500D-03	Unit
Spectral Response		300 to 650		185 to 650		nm
Peak Wavelength		400				nm
Photocathode Material		Bialkali				—
Window	Material	Borosilicate glass		UV glass		—
	Thickness	1.5				mm
Dynode	Structure	Metal channel dynode				—
	Number of Stages	12				—
Number of Anode Pixels		64 (8 × 8 matrix)				—
Pixel Size / Pitch at Center		5.8 × 5.8 / 6.08				mm
Effective Area		49 × 49				mm
Dimensional Outline (W × H × D)		52 × 52 × 27.4				mm
Packing Density (Effective Area / External Size)		89				%
Weight		125	105	125	105	g
Operating Ambient Temperature		0 to +50				°C
Storage Temperature		-15 to +50				°C

#### MAXIMUM RATINGS (Absolute Maximum Values)

Parameter	H8500C	H8500D	H8500C-03	H8500D-03	Unit
Supply Voltage (Between Anode to Cathode)	-1100				V
Average Anode Output Current in Total	100				μA
Divider Current at -1100 V	173				μA

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## CHARACTERISTICS (at 25 °C)

Parameter		Min.	Typ.	Max.	Unit
Cathode Sensitivity	Luminous <sup>Ⓐ</sup>	50	60	—	μA/lm
	Blue Sensitivity Index (CS 5-58) <sup>Ⓑ</sup>	8.0	9.5	—	—
Quantum Efficiency at 420 nm		—	24	—	%
Anode Sensitivity	Luminous <sup>Ⓒ</sup>	—	90	—	A/lm
Gain <sup>Ⓒ</sup>		$0.5 \times 10^6$	$1.5 \times 10^6$	—	—
Anode Dark Current per Channel <sup>Ⓓ</sup>		—	0.1	—	nA
Anode Dark Current in Total <sup>Ⓓ</sup>		—	6	50	nA
Time Response <sup>Ⓔ</sup>	Rise Time <sup>Ⓕ</sup>	—	0.8	—	ns
	Transit Time <sup>Ⓖ</sup>	—	6	—	ns
	Transit Time Spread (FWHM) <sup>Ⓗ</sup>	—	0.4	—	ns
Pulse Linearity per Channel (±2 % deviation)		—	1	—	mA
Anode Uniformity (Condition Figure 3)		—	1:2	1:4	—
Cross-talk <sup>Ⓙ</sup>		—	3	—	%

## NOTES

- Ⓐ: The light source is a tungsten filament lamp operated at a distribution temperature of 2856 K. Supply voltage is 150 volts between the cathode and all other electrodes connected together as anode.
- Ⓑ: The value is cathode output current when a blue filter (corning CS 5-58 polished to 1/2 stock thickness) 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 anode-to-cathode supply voltage and voltage distribution ratio shown in Table 1 below.
- Ⓓ: Measured with the same supply voltage and voltage distribution ratio as Note Ⓒ after 30 minute storage in darkness.
- Ⓔ: Those are test data when a signal from a central channel of 64 anodes is used, while all photocathode are illuminated by pulsed light source.
- Ⓕ: The rise time is the time for the output pulse to rise from 10 % to 90 % of the peak amplitude when the whole 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 single photoelectron event, and defined as the FWHM of the frequency distribution of electron transit time.
- Ⓙ: Supply Voltage: -1000 V Light Source: Tungsten filament lamp + blue filter (corning CS 5-58 polished to 1/2 stock thickness)  
Aperture Size: Approx. 5 mm × 5 mm  
One anode is illuminated through the aperture and the output of the adjacent anodes are calculated as relative value, with 100 % being equal to the output of the illuminated anode. The cross-talk is the relative value of the adjacent anodes expressed in %.

**Table 1: Voltage Distribution Ratio and Supply Voltage**

Electrodes	K	Dy1	Dy2	Dy3	Dy4	Dy5	Dy6	Dy7	Dy8	Dy9	Dy10	Dy11	Dy12	GR	P
Distribution Ratio	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.5

Supply Voltage: -1000 V, K: Cathode, Dy: Dynode, GR: Guard Ring P: Anode

Figure 1: Typical Spectral Response

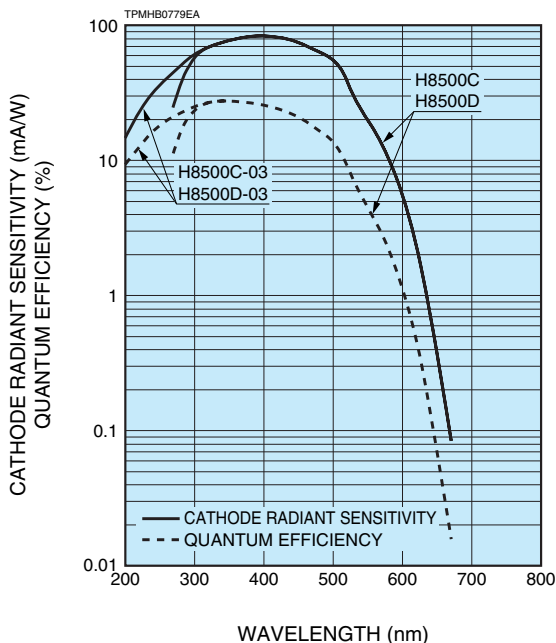


Figure 2: Typical Gain Characteristics

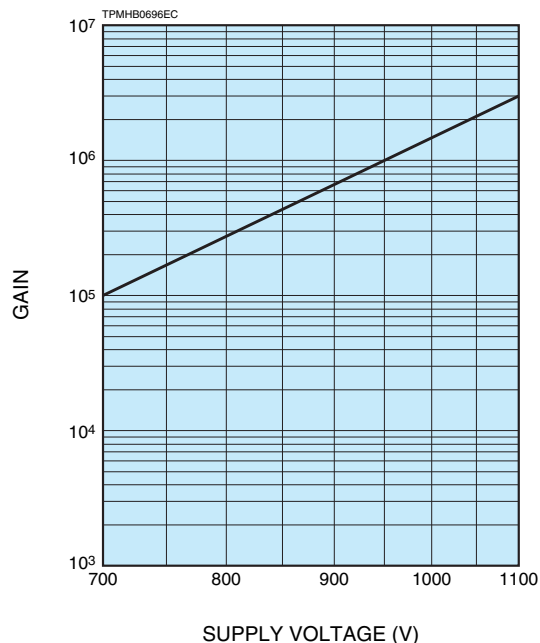
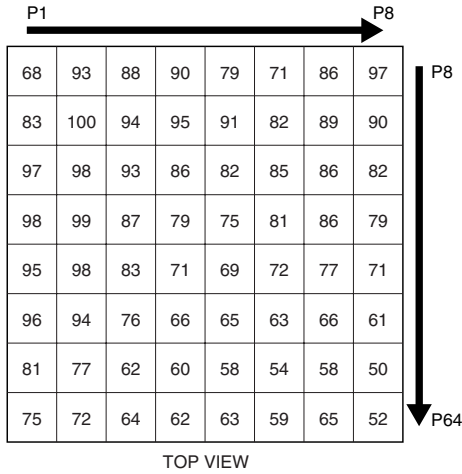


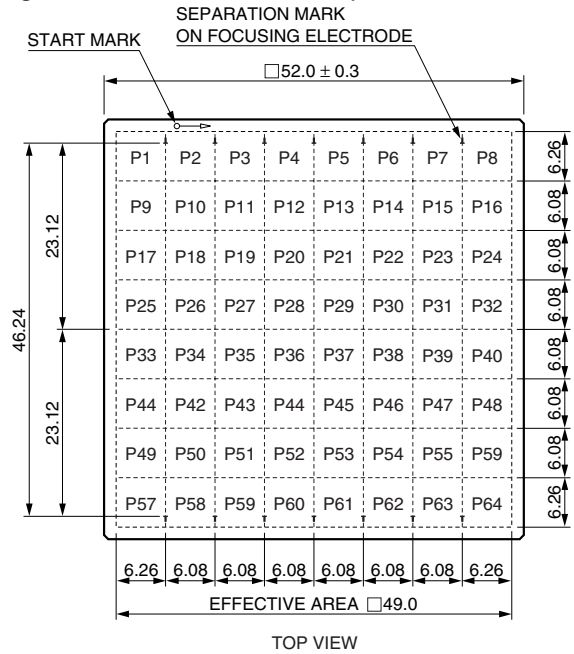
Figure 3: Anode Uniformity (Example)



SUPPLY VOLTAGE: -1000 V  
 LIGHT SOURCE: TUNGSTEN LAMP with BLUE FILTER (DC LIGHT)  
 SPOT ILLUMINATION (APERTURE SIZE): 6 mm square on each channel

TPMHB0697EC

Figure 4: Anode Matrix and Separation Mark

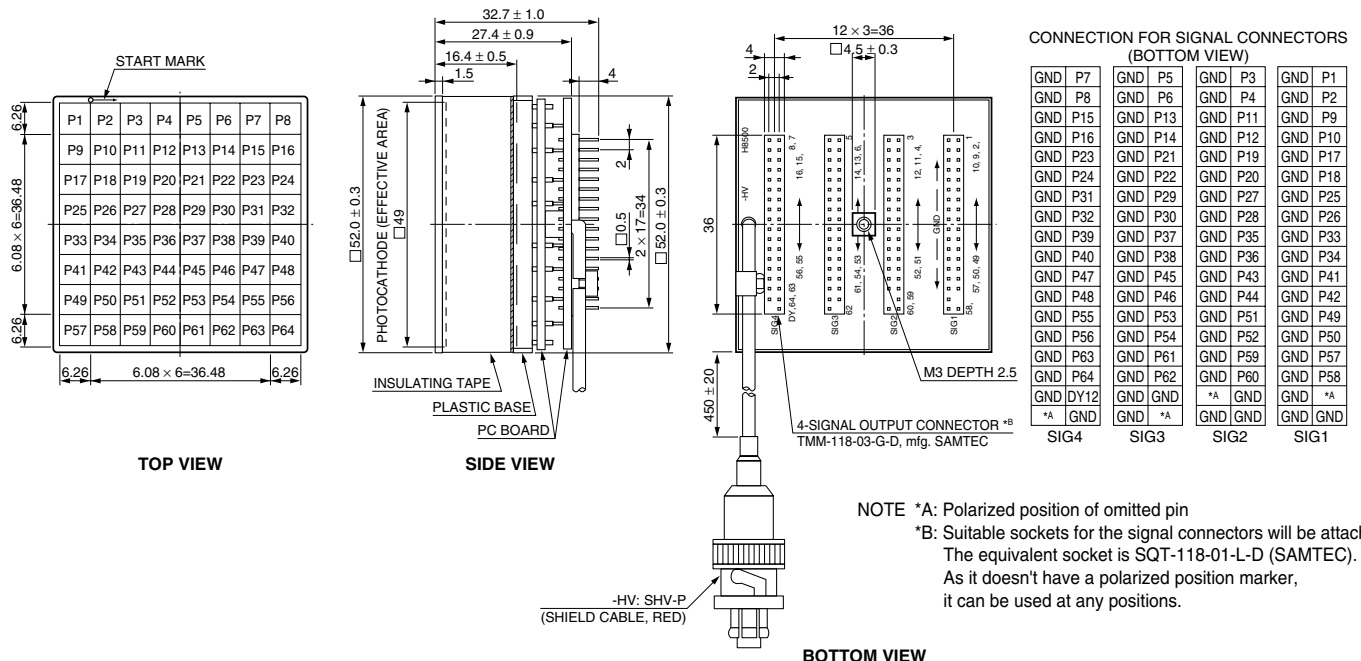


The start mark and the separation marks are put on an electrode plate inside.

TPMHB0708EB

Figure 5: Dimensional Outline (Unit: mm)

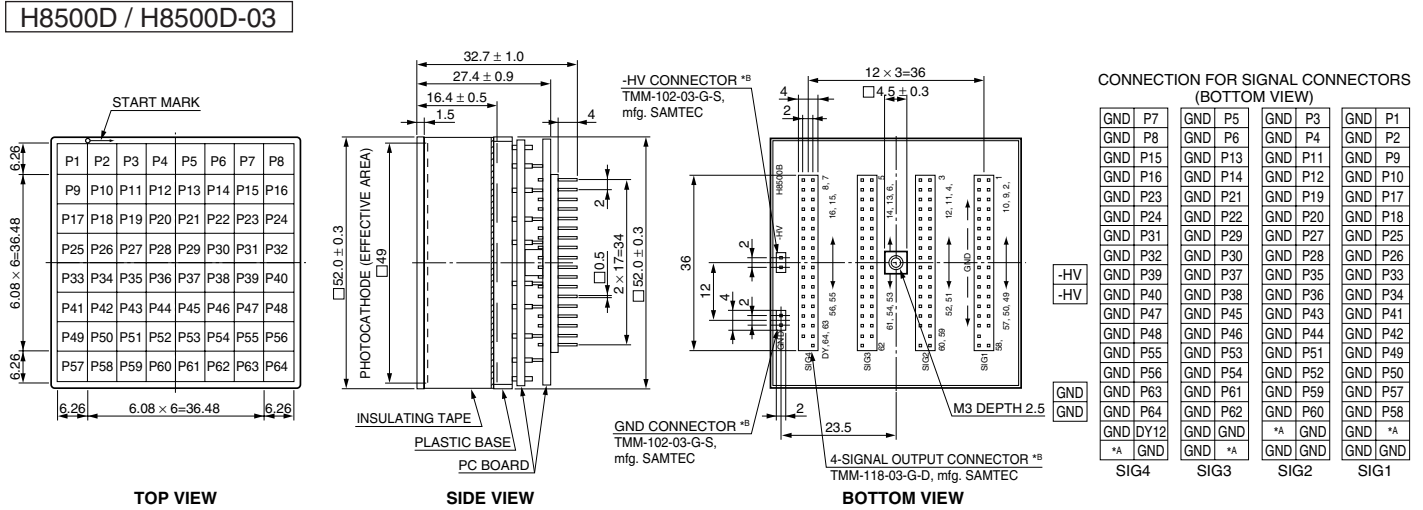
H8500C / H8500C-03



NOTE \*A: Polarized position of omitted pin  
 \*B: Suitable sockets for the signal connectors will be attached. The equivalent socket is SQT-118-01-L-D (SAMTEC). As it doesn't have a polarized position marker, it can be used at any positions.

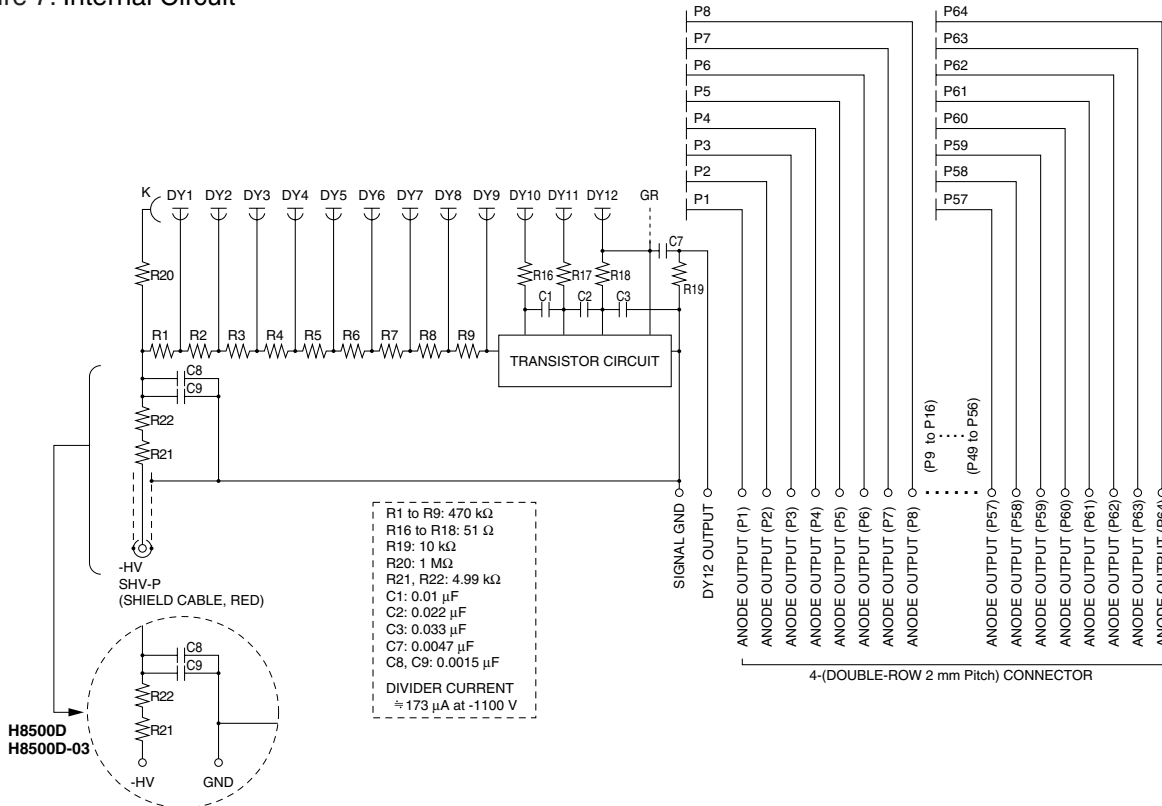
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Figure 6: Dimensional Outline (Unit: mm)



NOTE \*A: Polarized position of omitted pin  
 \*B: Suitable sockets for the signal connectors will be attached.  
 The equivalent socket for signal output is SQT-118-01-L-D (SAMTEC).  
 The equivalent socket for -HV, GND is SQT-102-01-L-S (SAMTEC).  
 As it doesn't have a polarized position marker,  
 it can be used at any positions.

Figure 7: Internal Circuit



TPMHA0544EA

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