HAMAMATSU

PHOTOMULTIPLIER TUBE
R1464

High Anode Sensitivity at Low Supply Voltage
19mm (3/4 Inch) Diameter, 10 Stage, Head-On Type
185 to 850nm Response Multialkali Photocathode

The Hamamatsu R1464 is a 19mm (3/4") diameter, head-on type photomultiplier tube having a multialkali photocathode designed for use in UV to near IR spectrophotometers and other analysis equipments where wide range response and high gain are of importance. The R1464 exhibits a high anode sensitivity at relatively low supply voltage by virtue of improvement in secondary emitting surface, compared with the Hamamatsu R663 photomultiplier tube which has the same spectral response characteristic and mechanical specifications as the R1464.

FEATURES

- **High Anode Sensitivity**
  - **Radiant (420nm) ..... 5.1×10^4 A/W at 1000V**
  - **Luminous ..... 120 A/lm at 1000V**
- **High Quantum Efficiency (290nm) 19%**
- **Wide Spectral Response ..... 185 to 850nm**
- **Low Anode Dark Current ..... 10 nA at 1000V**

APPLICATIONS

- **UV to Near IR Spectrophotometers**
- **Laser Detection Systems**
- **Photon Counting Systems**

GENERAL

Parameter		Description/Value	Unit
Spectral Response		185 to 850	nm
Wavelength of Maximum Response		420	nm
Photocathode	Material	Multialkali	—
	Minimum Useful Size	15	mm dia.
Window	Material	UV glass	—
	Shape	Plano-plano	—
Dynode	Secondary Emitting Surface	Multialkali	—
	Structure	Linear focused	—
	Number of Stages	10	—
Direct Interelectrode Capacitances (Approx.)	Anode to Last Dynode	1.7	pF
	Anode to All Other Electrodes	3.5	pF
Base		12 pin glass base	—
Weight		14	g
Suitable Socket		E678-12D (supplied)	—
Suitable Socket Assembly		E974-05 (option)	—

MAXIMUM RATINGS (Absolute Maximum Values)

Parameter		Value	Unit
Supply Voltage	Between Anode and Cathode	1250	Vdc
	Between Anode and Last Dynode	250	Vdc
Average Anode Current (Note 1)		0.1	mA
Average Cathode Current (Note 1)		100	nA/cm^2
Ambient Temperature		-80 to +50	°C

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CHARACTERISTICS (at 25°C)

Parameter		Min.	Typ.	Max.	Unit
Anode Sensitivity (Note 2)	Luminous (Note 3)	30	120	—	A/lm
	Radiant at 350nm	—	4.9×10^4	—	A/W
	at 420nm	—	5.1×10^4		A/W
	at 633nm	—	1.9×10^4	—	A/W
Cathode Sensitivity	Luminous (Note 4)	80	120	—	μA/lm
	Radiant at 350nm	—	49	—	mA/W
	at 420nm	—	51	—	mA/W
	at 633nm	—	19	—	mA/W
	Quantum Efficiency at 290nm	—	19	—	%
	Red/White Ratio (Note 5)	0.15	0.2	—	—
Gain (Note 2)		—	1×10^6	—	—
Anode Dark Current (Note 2)	After 30 minute storage in the dark	—	4	20	nA
ENI (Equivalent Noise Input) (Note 6)		—	7×10^{-16}	—	W
Time Response	Anode Pulse Rise Time (Note 2, 7)	—	2.5	—	ns
	Electron Transit Time (Note 2, 8)	—	27	—	ns

NOTES

1: Averaged over any interval of 30 seconds maximum.

2: The Voltage distribution ratio is shown in Table 1 below.

3: The light source is a tungsten filament lamp operated at a distribution temperature of 2856K. The light input is 0.1 micro-lumen.

4: Under the same conditions as Note 3 except that the light input is 10^{-2} lumen and 150 volts are applied between cathode and all other electrode connected together as anode.

5: Red/White Ratio is quotient of the cathode current measured using a red filter (Toshiba R-68) interposed between the light source and the tube by the cathode current measured with the filter removed under the same conditions as Note 4.

6: ENI is an indication of photon limited signal-to-noise ratio. It refers to the amount of light in watts to produce a signal-to-noise ratio in unity in the output of a photomultiplier tube. In this catalog the value of peak wavelength is described. ENI is given by the following formula:

$$ENI = \frac{\sqrt{2q \bullet Idb \bullet G \bullet \Delta f}}{S}$$

where q = Elementary charge (1.60×10^{-19} coulomb)

Idb = PMT anode dark current (after 30 minute storage) in amperes

G = PMT gain

Δf = Bandwidth of the system in hertz. In this catalog, 1 Hz bandwidth is used.

S = Anode radiant sensitivity in amperes per watt at the wavelength of peak response.

7: 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.

8: The electron transit time is the interval between the arrival of a delta function light pulse at the entrance window of the tube and the time the output pulse reaches the peak amplitude. In measurement the entire photocathode is illuminated.

Table 1: VOLTAGE DISTRIBUTION RATIO

Electrodes	K	Dy1	Dy2	Dy3	Dy4	Dy5	Dy6	Dy7	Dy8	Dy9	Dy10	P
Distribution Ratio	1.5	1	1	1	1	1	1	1	1	1	1	1

Supply Voltage: 1000Vdc, K: Cathode, Dy: Dynode, P: Anode

Figure 1: Typical Spectral Response

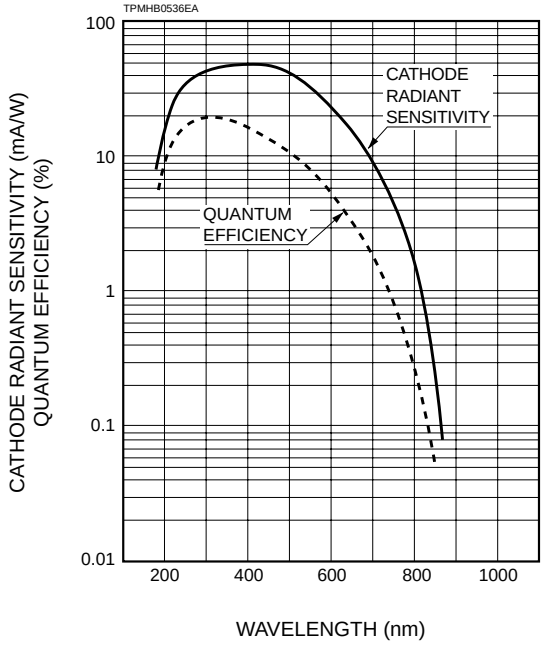


Figure 2: Anode Sensitivity and Gain Characteristics

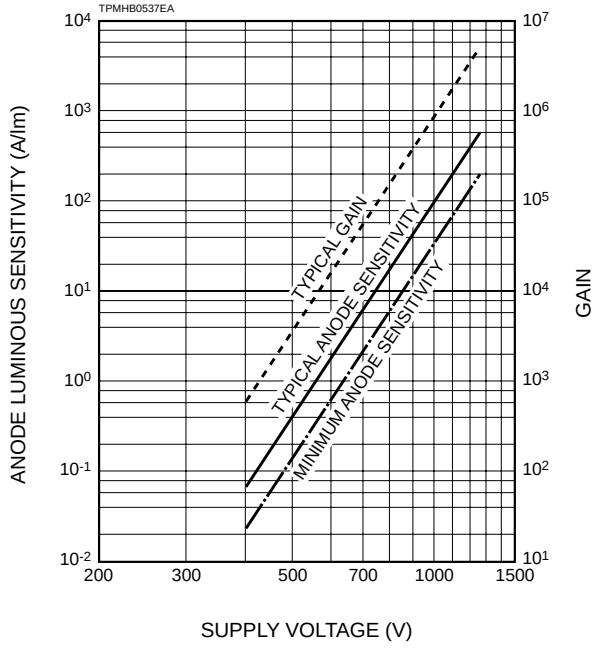


Figure 3: Typical Time Response

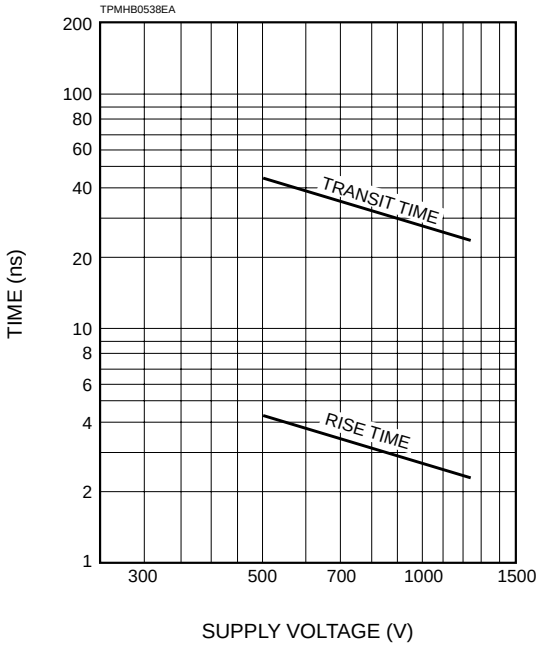


Figure 4: Typical Temperature Coefficient of Anode Sensitivity

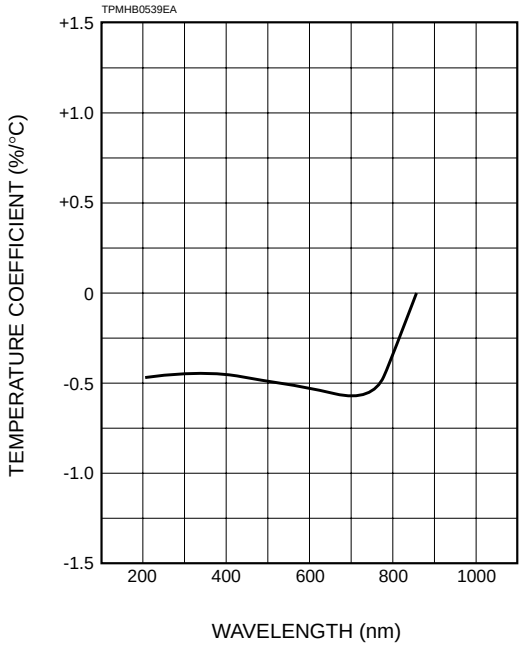
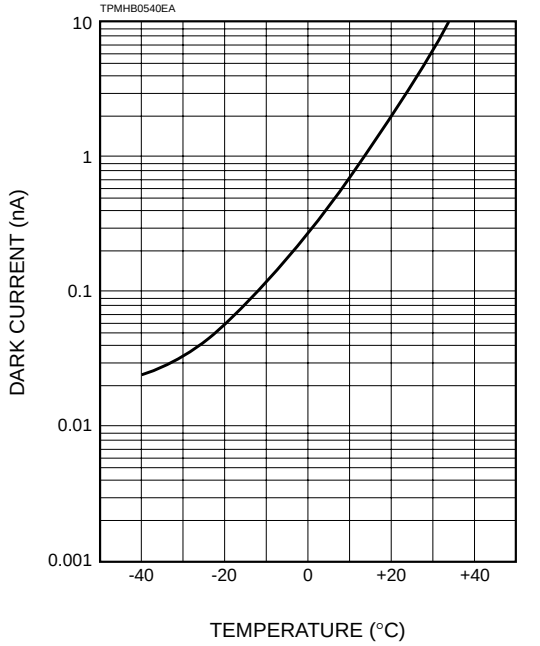
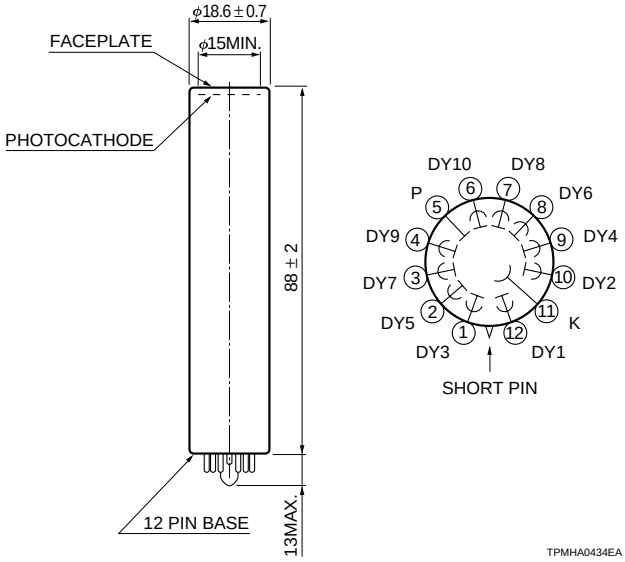


Figure 5: Typical Temperature Characteristic of Dark Current (After 30 minute storage)



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Figure 6: Dimensional Outline (Unit: mm)



Socket (E678-12L)

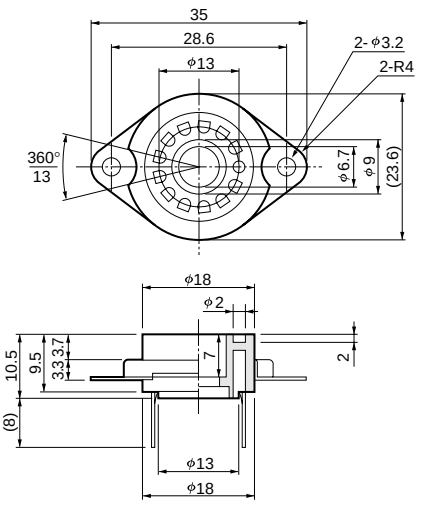
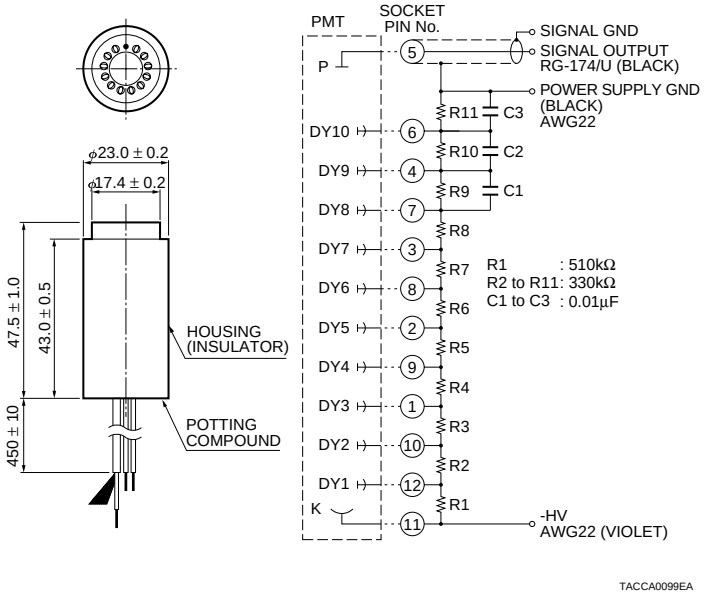


Figure 7: Optional Socket Assembly E974-13 (Unit: mm)

The E974-13 is socket assembly specifically designed for 3/4 inch diameter, 10 stage, head-on type photomultiplier tubes having a 12-pin glass base. It contains a voltage-divider network potted with silicone rubber, thus eliminating troublesome soldering for making up the divider network.



Warning - Personal Safety Hazards
Electrical Shock — Operating voltage applied to this device presents shock hazard.

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