

For Scintillation Counting, Especially for Gamma Camera 76mm (3 Inch) Diameter, 8 Stage, Head-on Type Bialkali Photocathode Photomultiplier Tubes

FEATURES

| | Typ. | Max. |
|--|------|-------|
| ● Quantum Efficiency at 420nm | 30 | — % |
| ● Pulse Height Resolution | | |
| with ¹³⁷ Cs Source (Note 1, 2) | 6.3 | 7.0 % |
| with ⁵⁷ Co Source (Note 1, 2) | 8.5 | 9.0 % |
| ● Stability | | |
| Anode Current Drift (D.C. Output) (Note 1, 3) | 3 | — % |
| Long Term (MGD) (For 16 Hours at 1,000 cps) (Note 1, 4a) | 0.5 | — % |
| Short Term (From 10,000 cps to 1,000 cps) (Note 1, 4b) | 0.5 | — % |

GENERAL

| Parameter | | Description/Value | Unit |
|--|--|------------------------|------|
| Spectral Response | | 300 to 650 | nm |
| Wavelength of Maximum Response | | 420 ± 30 | nm |
| Direct Interelectrode Capacitances (approx.) | Anode to Dynode No. 8 | 6.0 | pF |
| | Anode to All Other Electrodes | 6.5 | pF |
| Window | Material | Borosilicate glass | — |
| | Index of Refraction at 420nm | 1,500 ± 0.001 | — |
| | Face Plate Flatness | Less than ± 50 | μm |
| | Shape | Plano-plano | — |
| Dynode | Structure | Box and grid | — |
| | Material of Secondary Emitting Surface | Alkali-antimonide | — |
| Operating Position | | Any | — |
| Weight (approx.) | | 190 | g |
| Socket | | E678-14A or equivalent | — |

MAXIMUM RATINGS (Absolute Maximum Values)

| Parameter | | Value | Unit |
|----------------------------------|--------------------------------|---|------|
| Supply Voltage | Between Anode and Cathode | 1500 | Vdc |
| | Between Anode and Dynode No. 8 | 300 | Vdc |
| Average Anode Current (Note 5) | | 0.1 | mA |
| Average Cathode Current (Note 6) | | 50 | nA |
| Ambient Temperature | | -80 to +50 (R1307-01) -30 to +50 (R1307) | °C |

CHARACTERISTICS (at 25°C)

| Parameter | Min. | Typ. | Max. | Unit |
|--|------------------------------------|-----------------------|------|------------|
| Anode Luminous Sensitivity (Note 1, 7) | 3 | 30 | — | A/lm |
| Anode Blue Sensitivity (Note 1, 8) | — | 3.2 | — | A/lm-blue |
| Cathode Luminous Sensitivity (Note 9) | 80 | 110 | — | μA/lm |
| Cathode Blue Sensitivity (Note 10) | 10 | 12.0 | — | μA/lm-blue |
| Gain | — | 2.7 × 10 ⁵ | — | — |
| Anode Dark Current (Note 1, 11) | — | 2 | 20 | nA |
| Time Response | Anode Pulse Rise Time (Note 1, 12) | — | 8 | ns |
| | Electron Transit Time (Note 1, 13) | — | 64 | ns |

PHOTOMULTIPLIER TUBES R1307, R1307-01

Figure 1: Typical Spectral Response

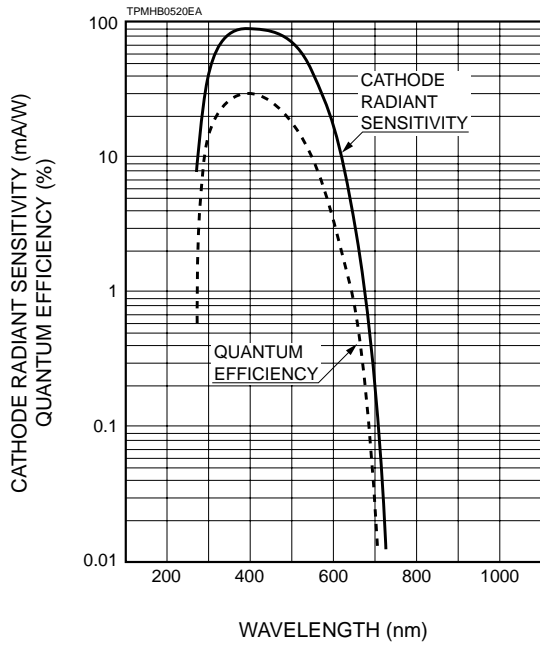


Figure 2: Anode Sensitivity and Gain Characteristic (Note 1, 7)

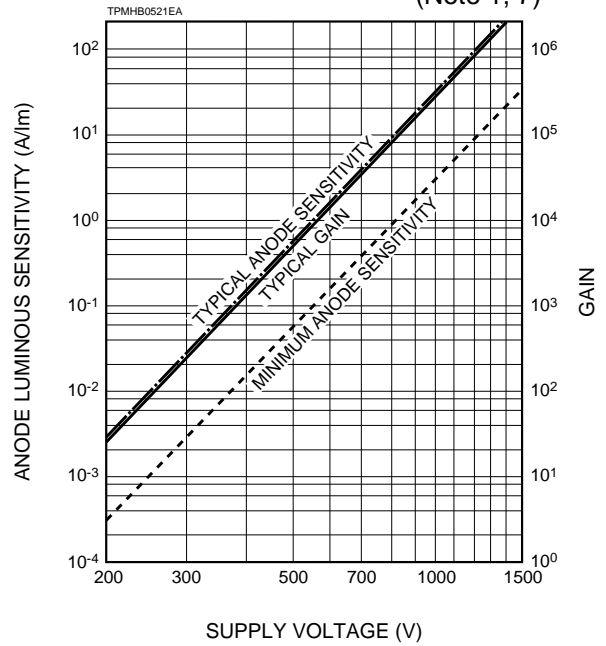


Figure 3: Typical Time Response (Note 1, 12, 13)

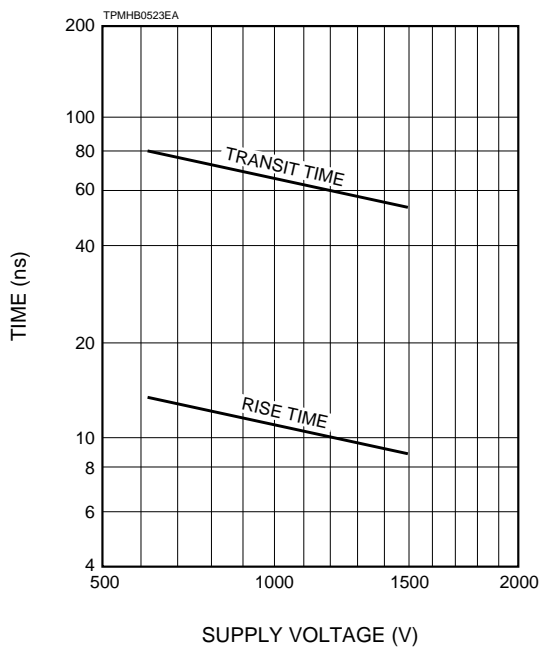


Figure 4: Typical Temperature Characteristic on Dark Current (Note 1)
Measured after 15-hour storage in the dark

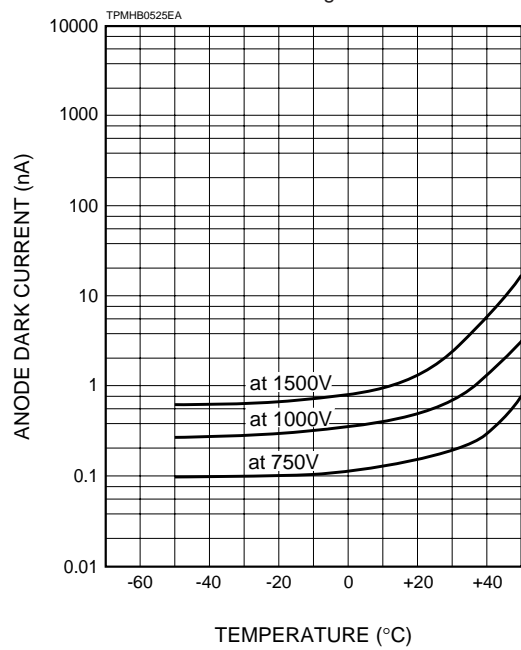
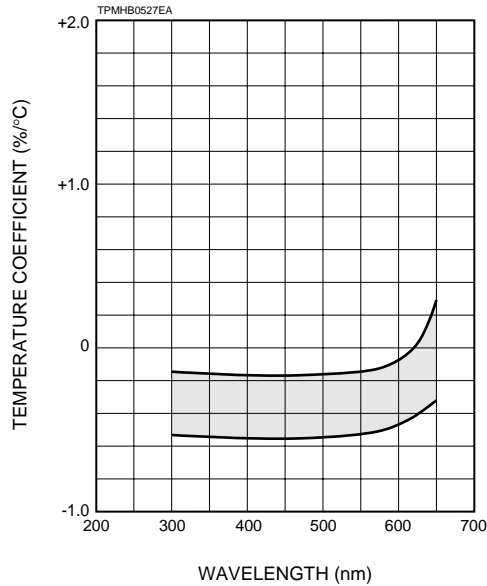


Figure 5: Typical Temperature Coefficient of Anode Sensitivity (-20 to +60°C, Note 1)



NOTES

1: Voltage distribution ratio

| Electrodes | K | G | Dy1 | Dy2 | Dy3 | Dy4 | Dy5 | Dy6 | Dy7 | Dy8 | P |
|--------------------|---|---|-----|-----|-----|-----|-----|-----|-----|-----|---|
| Distribution Ratio | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

Supply voltage (Ebb) = 1000Vdc

K: cathode, G: Focusing Electrode, Dy: Dynode, P: Anode

- Scintillator is manufactured by Harshaw Chemical, (Type 12A12), and BICRON (Type 3R3), NaI (TI), 3" diameter 3" thickness.
- Drift for 1 hour after 10 minutes of initial warming up with 10μA anode current.
- A ¹³⁷Cs source and an NaI (TI) crystal are employed to measure the pulse height. Warming up time is about 1 hour.

a) Long term (Mean Gain Deviation) is defined as follows.

$$Dg = \frac{\sum_{i=1}^n |P - P_i|}{n} \cdot \frac{100}{P} (\%)$$

where P is the mean pulse height averaged over n readings, P_i is the pulse height at the i-th reading, and n is the total number of readings.

b) Short term

Scintillator (NaI (TI) crystal) is 3" diameter 3" thickness. The photomultiplier is first operated at about 10,000 cps. The photopeak counting is then decreased to approximately 1,000 cps by increasing the distance between source and crystal on the tube.

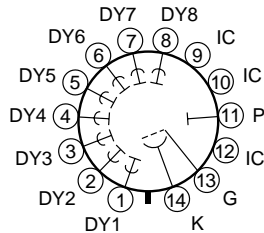
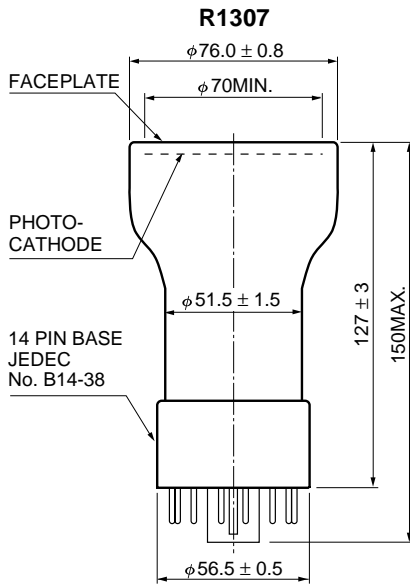
- Averaged over any interval of 30 seconds maximum.
- Same as Note 5 and the whole photocathode is illuminated.
- The light source is a tungsten filament lamp operated at a distribution temperature of 2856K. The light input of 10⁻⁷ lumen is used.
- The value is anode output current when the blue filter (Corning CS 5-58 polished to 1/2 stock thickness) is interposed between the light source (providing 10⁻⁷ lumen) and the tube under the same condition as Note 7.
- The condition is the same shown in Note 7 except that the value of light input is 10⁻⁴ lumen and 150 volts are applied between cathode and all other electrodes connected together as anode.
- These values are cathode output current when the blue filter (Corning CS 5-58 polished to 1/2 stock thickness) is interposed between the light source (providing 10⁻⁴ lumen) and the tube under the same condition as Note 9.
- Measured after 5-second strage in the dark.
- The rise time is the time for the output pulse to rise from 10% to 90% of the peak output when the tube is illuminated by a flash of light of very short duration. In measurement, the whole photocathode is illuminated.
- 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 output pulse at the anode terminal reaches peak amplitude.
- m is the mean value of total counts, i.e.

$$\sum_{0.3m}^m (\text{counts per channel}) = \sum_m^{3m} (\text{counts per channel})$$

Test conditions: Incident light wavelength is 400nm. Supply voltage is +1300V. Ambient temperature is 20°C.

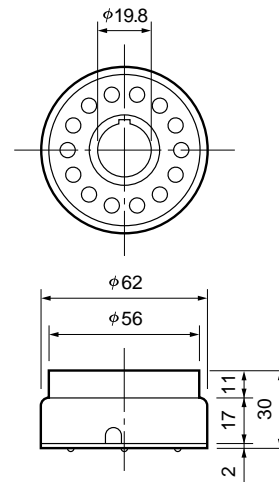
PHOTOMULTIPLIER TUBES R1307, R1307-01

Figure 6: Dimensional Outlines (Unit: mm)

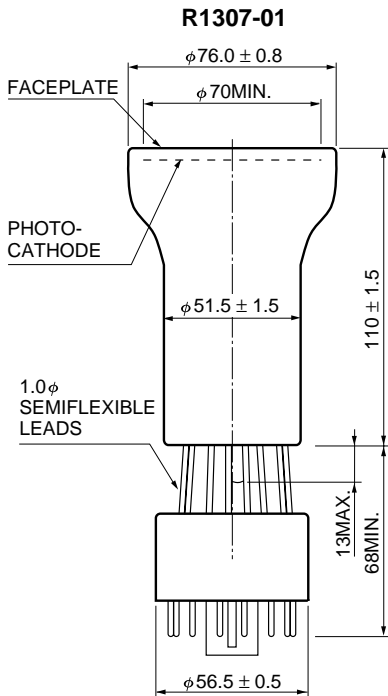


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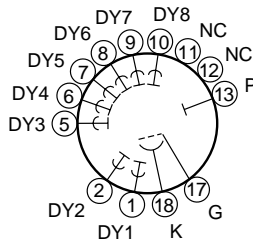
Socket (OPTION) (E678-14A)



TACCA0044EB



Basing Diagram (Bottom View at Semiflexible Leads)



*Basing diagram of temporary base is the same as that of R1307.

TPMHA0433EA

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

HAMAMATSU

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