

Compact High Sensitivity MCP-PMT Series Featuring with Fast Time Response

FEATURES

- High Sensitivity
QE: 12 % (-61), 36 % (-63), 40 % (-64)
- High Speed
Rise Time: 200 ps (-61), 180 ps (-63/-64)
IRF[®] (Instrument Response Function): 150 ps at FWHM: (-61)
60 ps at FWHM: (-63/-64)
- Compact Profile
Effective Photocathode: 10 mm diameter
(Overall length: 70.2 mm, Outer diameter: 45.0 mm)

APPLICATIONS

- Molecular Science
Analysis of Molecular Structure
- Medical Science
Optical Computer Tomography
- Biochemistry
Fast Gene Sequencing
- Material Engineering
Semiconductor Analysis
Crystal Research
- Lidar

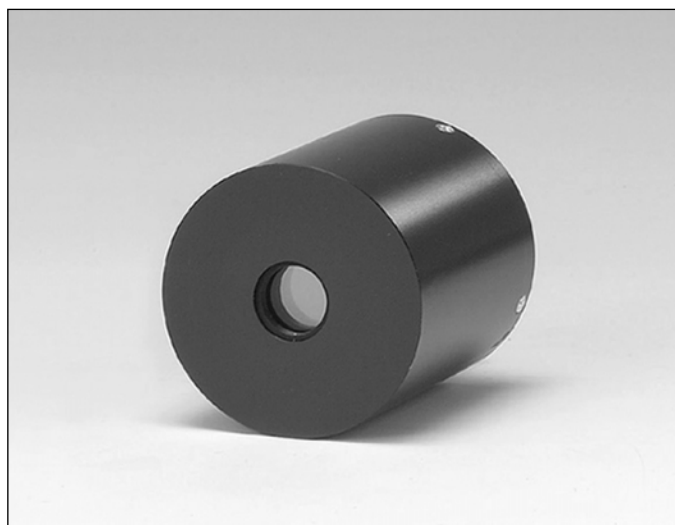


Figure 1: Spectral Response

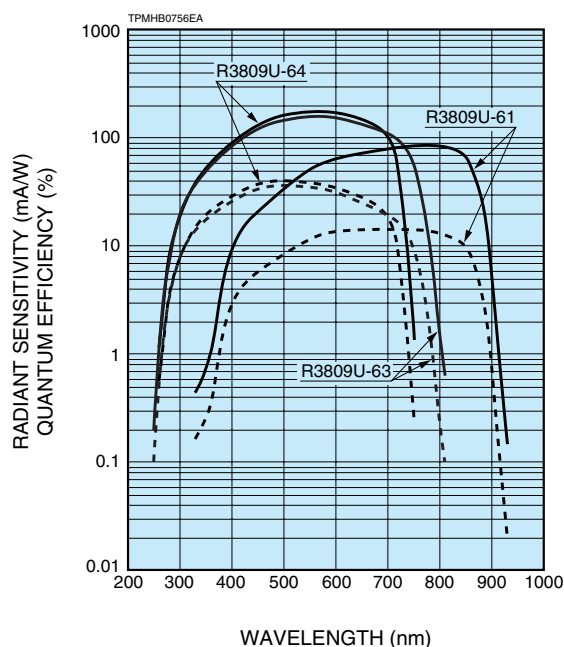
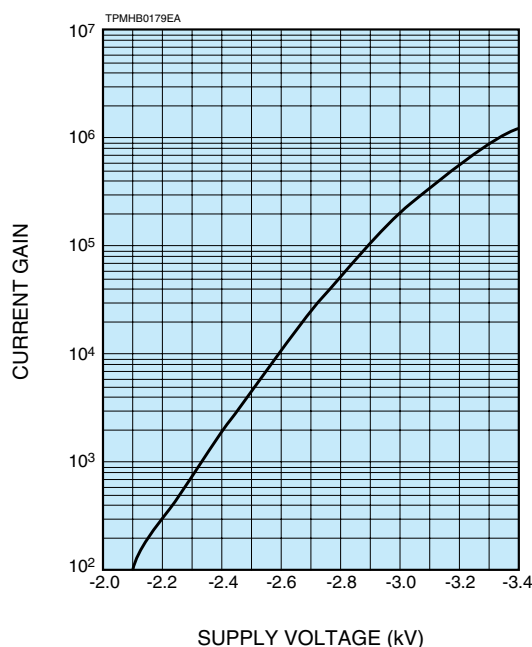


Figure 2: Typical Gain



SPECIFICATIONS

●R3809U-61/-63/-64

GENERAL

Parameter	R3809U-61	R3809U-63	R3809U-64	Unit
Spectral Response	370 to 920	280 to 820	280 to 720	nm
Peak Wavelength	750 to 850	550 to 650	550 to 650	nm
Photocathode Material	GaAs	Extended Red GaAsP	GaAsP	—
Window Material	Borosilicate Glass			—
Effective Area of PMT	$\phi 10$			mm
Stage of MCP [®]	2			—
Operating Ambient Temperature	-50 to +50			°C
Storage Temperature	-50 to +50			°C

MAXIMUM RATING

Parameter	R3809U-61	R3809U-63	R3809U-64	Unit
PMT Supply Voltage	-3400			V
Average PMT Anode Current	100			nA
Pulsed Peak Current ^③	350			mA

CHARACTERISTICS (at -3000 V, +25 °C)

Parameter		R3809U-61			R3809U-63			R3809U-64			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	
Cathode Sensitivity	Luminous ^①	400	700	—	450	750	—	400	700	—	μA/lm
	Radiant ^②	—	85	—	—	160	—	—	180	—	μA/W
	Quantum Efficiency ^②	—	12	—	27	36	—	30	40	—	%
Gain		1×10^5	2×10^5	—	1×10^5	2×10^5	—	1×10^5	2×10^5	—	—
Anode Dark Count ^④		—	20 ^①	—	—	2×10^4	—	—	1×10^4	—	s ⁻¹
Time Response	Rise Time ^⑤	—	200	—	—	180	—	—	180	—	ps
	Fall Time ^⑥	—	500	—	—	400	—	—	400	—	ps
	IRF (FWHM) ^⑦	—	150	—	—	60	—	—	60	—	ps

NOTE: ① IRF stands for Instrument Response Function which is a convolution of the δ pulse function (H(t)) of the measuring system and the excitation function (E(t)) of a laser. The IRF is given by the following formula:

$$\text{IRF} = H(t) \times E(t)$$

We specify the IRF as an FWHM of the time distribution taken by using the measuring system in Figure 5 that is Hamamatsu standard IRF measurement. It can be temporary estimated by the following equation:

$$(\text{IRF (FWHM)})^2 = (\text{TTS})^2 + (\text{Tw})^2 + (\text{Tj})^2$$

where Tw is the pulse width of the laser used and Tj is the time jitter of all equipments used. An IRF data is provided with the tube purchased as a standard.

Transit-time spread (TTS) is the fluctuation in transit time between individual pulse and specified as an FWHM (full width at half maximum) with the incident light having a single photoelectron state.

② Two microchannel plates (MCP) are incorporated as a standard but we can provide it with either one or three MCPs as an option depending upon your request.

③ This is specified under the operating conditions that the repetition rate of light input is 100 Hz or below and its pulse width is 70 picoseconds.

④ The light source used to measure the luminous sensitivity is a tungsten filament lamp operated at a distribution temperature of 2856 K. The incident light intensity is 10^{-4} lm and 100 V is applied between the photocathode and all other electrodes connected as an anode.

⑤ Measured at the peak sensitivity wavelength.

⑥ At 30 minutes after high voltage is applied with shutter closed

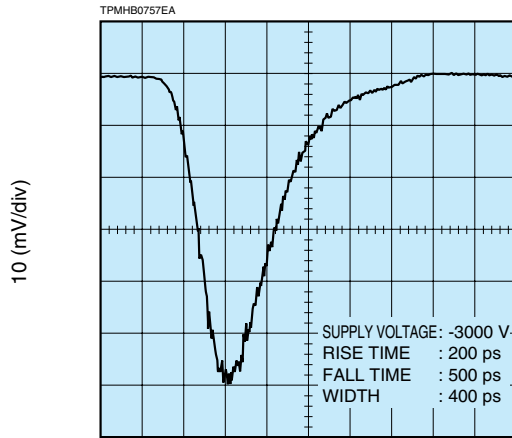
⑦ This is the mean time difference between the 10 % and 90 % amplitude points on the output waveform for full cathode illumination.

⑧ This is the mean time difference between the 90 % and 10 % amplitude points on the tailing edge of the output waveform for full cathode illumination.

⑨ At -30 °C

Figure 3: Typical Output Waveform

●R3809U-61



●R3809U-63/-64

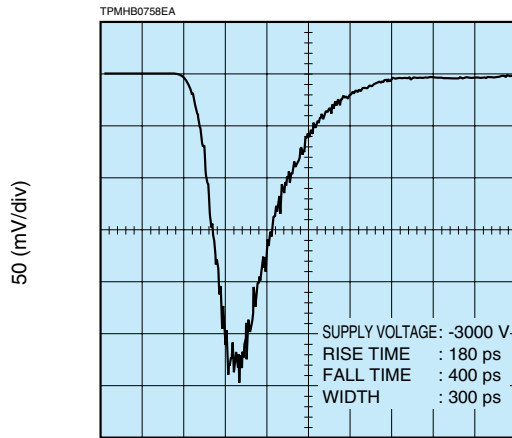


Figure 4: Block Diagram of Output Waveform Measuring System

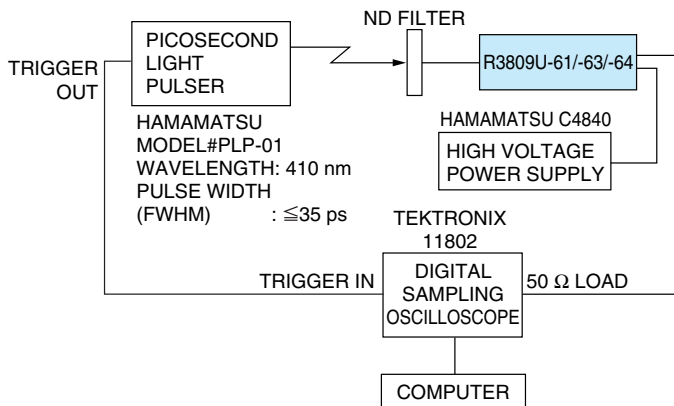
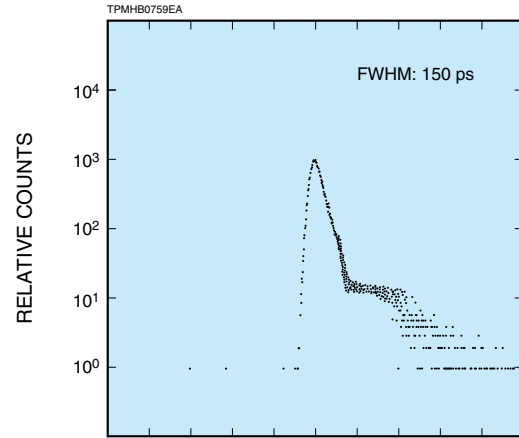


Figure 5: Typical Instrument Response Function (IRF) [Ⓐ]

●R3809U-61



●R3809U-63/-64

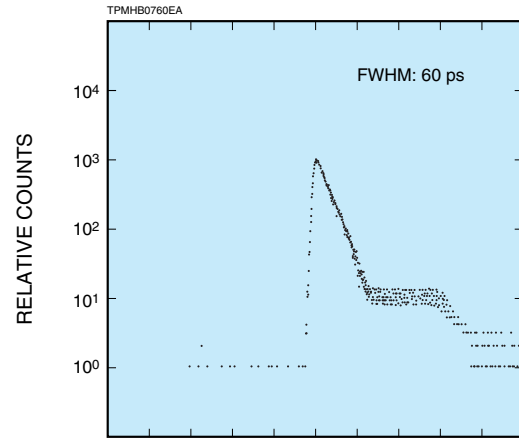
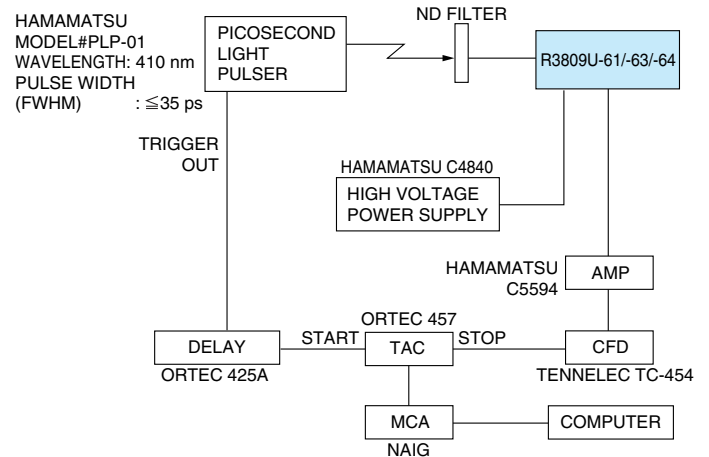


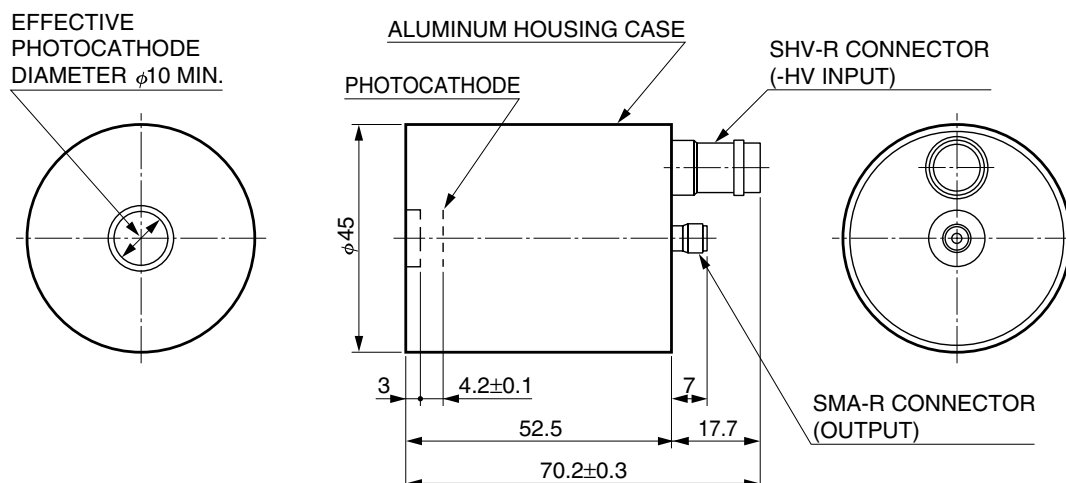
Figure 6: Block Diagram of IRF Measuring System



MCP-PMT R3809U-61/-63/-64

Figure 7: Dimensional Outlines (Unit: mm)

●R3809U-61/-63/-64



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ACCESSORIES

THERMOELECTRIC COOLING UNIT C10373

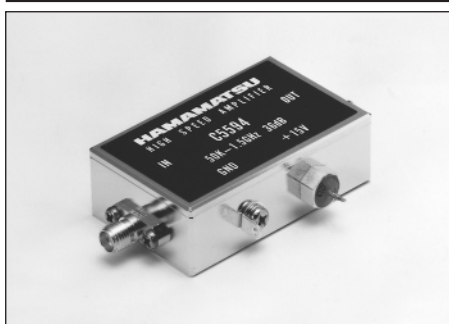


Specifications

Cooling Thermoelectric Effects
Heat exchange Medium (coolant) Water
Temperature controllable range -30°C to 0°C
Optical window material Evacuated double-pane synthetic silica

Note: C10373 requires a holder (e.g E3059-500).

HIGH SPEED AMPLIFIER C5594 Series



Specifications

Frequency
Response Range 50 kHz to 1.5 GHz
Gain 36 dB (Typ.)
Input/Output Impedance 50 Ω
Noise Figure (NF) 7 dB (Typ.)
Supply Voltage +12 V to +16 V
Recommend Input Voltage +15 V
Supply Current 95 mA (Typ.)

BENCH-TOP HIGH VOLTAGE POWER SUPPLY C9727 Series



Specifications

Output Voltage 0 V to ± 3500 V
Maximum Output Current 2 mA
Line Regulation Against $\pm 10\%$ Line Voltage Change ^{(A)(B)} (Max.) $\pm 0.005\%$
Load Regulation Against 0 % to 100 % Load Change ^(A) (Max.) $\pm 0.03\%$
Ripple / Noise (p-p) ^{(A)(B)} (Max.) 0.003 %
Drift (after 30 min Warm-up) ^{(A)(B)} (Max.) $\pm 0.05\%$ / h
Temperature Coefficient ^{(A)(B)} (Max.) .. $\pm 0.01\%$ / $^{\circ}\text{C}$
AC Input Voltage
C9727 / C9727-50 120 V ($\pm 10\%$) (50 / 60 Hz)
C9727-01 / C9727-51 ... 230 V ($\pm 10\%$) (50 / 60 Hz)
Power Consumption ^{(A)(B)} Approx. 40 V·A

NOTE: ^(A)At maximum output voltage
^(B)At maximum output current

HAMAMATSU

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