

# LOW-LIGHT-LEVEL MEASUREMENT IN THE NIR

# THERMOELECTRIC COOLED NIR-PMT UNIT

## H12694-25/-45/-75

**Wavelength Range: 950 nm to 1200 nm / 950 nm to 1400 nm / 950 nm to 1700 nm,  
TE Cooled, High Speed, Suitable for Photon Counting, Gate Function (Normally OFF)**



Left: NIR-PMT Unit, Right: Controller

## OVER VIEW

The H12694 series is an NIR-PMT unit using a compact NIR-PMT (near infrared photomultiplier tube) developed by our advanced photocathode technology. The NIR-PMT is contained in a thermally insulated sealed-off housing evacuated to a high vacuum. The internal thermoelectric cooler eliminates the need for liquid nitrogen and cooling water.

The light input window of these modules use a condenser lens to provide a virtually larger photosensitive area allowing easy optical coupling. The gating function prevents from saturation caused by excessive light input. Adapters for connection to an optical fiber and monochromator are also available as options.

## APPLICATIONS

- LIDAR
- Excitation Singlet Oxygen Measurement
- Delayed Fluorescence

## FEATURES

- Gate Function (Normally OFF)  
Gate Width: 1  $\mu$ s (Min.) to 10 ms (Max.)  
Repetition Rate: 10 kHz (Max.)
- High Sensitivity (Applicable to Photon Counting)
- Fast Time Response  
Rise Time: 0.9 ns, T.T.S.: 400 ps
- Simple Operation by Air Cooled TE Cooler  
No Liquid Nitrogen, No Cooling Water is Necessary
- Operable in 20 min after Switched ON
- Large Detection Area  $\phi$ 18 mm for Collimated Light
- HV Power Supply with Interlock Function
- Optional Adapters are Available  
For Optical Fibers, For Monochromators

# SPECIFICATIONS

## GENERAL

Parameter	H12694-25	H12694-45	H12694-75	Unit
Spectral Response	950 to 1200	950 to 1400	950 to 1700	nm
Photocathode Material	InP/InGaAsP	InP/InGaAsP	InP/InGaAs	—
Detection Area for Collimated Light	$\phi 18$			mm
Effective Area of PMT	$\phi 1.6$			mm
PMT Operating Temperature	-60			°C
PMT Operating Guaranteed Voltage	-500 to -900			V
Operating Ambient Temperature	+5 to +40			°C
Operating Ambient Humidity <sup>①</sup>	Less than 80			%
Storage Temperature	-20 to +50			°C
Storage Humidity <sup>①</sup>	Less than 80			%

① No condensation

## MAXIMUM RATING

Parameter	H12694-25	H12694-45	H12694-75	Unit
PMT Supply Voltage	-900			V
Average PMT Anode Current	1			$\mu$ A

## CHARACTERISTICS (at -800 V, -60 °C)

Parameter	H12694-25			H12694-45			H12694-75			Unit	
	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.		
Cathode Sensitivity <sup>②</sup>	Quantum Efficiency	1	2	—	1	2	—	1	2	—	%
	Radiant	—	18	—	—	21	—	—	25	—	mA/W
Anode sensitivity <sup>②</sup>	Radiant	—	$1.8 \times 10^4$	—	—	$2.1 \times 10^4$	—	—	$2.5 \times 10^4$	—	A/W
Gain	$5 \times 10^5$	$1 \times 10^6$	—	$5 \times 10^5$	$1 \times 10^6$	—	$5 \times 10^5$	$1 \times 10^6$	—	—	
Anode Dark Current <sup>②③</sup>	—	0.4	1	—	4	10	—	40	100	nA	
Anode Dark Count <sup>③</sup>	—	$2.5 \times 10^3$	—	—	$2.5 \times 10^4$	—	—	$2.5 \times 10^5$	—	s <sup>-1</sup>	
Time Response	Anode Pulse Rise Time	—	0.9	—	—	0.9	—	—	0.9	—	ns
	Anode Pulse Fall Time	—	1.7	—	—	1.7	—	—	1.7	—	ns
	Transit Time Spread	—	0.4	—	—	0.4	—	—	0.4	—	ns

② At 1100 nm (H12694-25), at 1300 nm (H12694-45), at 1500 nm (H12694-75)

③ At 30 minutes after high voltage is applied with shutter closed and anode radiant sensitivity = 10000 A/W.

## MODULE, CONTROLLER

Parameter	Value / Description	Unit
Cooling Method	Thermoelectric (Forced Air Cooling)	—
Condenser Lens Material	BK7 AR Coating ( $\lambda$ 900 nm to 1700 nm)	—
Diameter of the Condenser Lens (Effective Area)	$\phi 20$ ( $\phi 18$ )	mm
F Number of the Condenser Lens (Focal length) <sup>④</sup>	1.4 (f=25)	—
Cooling Time Required for Operation	Approx. 20	min
Protection Function	High Voltage Interlock for Inappropriate Temperature	—
Input Voltage (AC)	100 to 240 ( $\pm 10$ %) (50 Hz / 60 Hz)	V
Dimensions (W × H × D) <sup>⑤</sup>	Module	100 × 186 × 150
	Controller	102 × 131 × 279.5
Weight	Module <sup>⑥</sup>	Approx. 2.28
	Controller <sup>⑦</sup>	Approx. 2.90

④ At 1300 nm    ⑤ Excluding projections.    ⑥ Including resistor box with BNC connectors.    ⑦ Including high voltage cable and control cable.

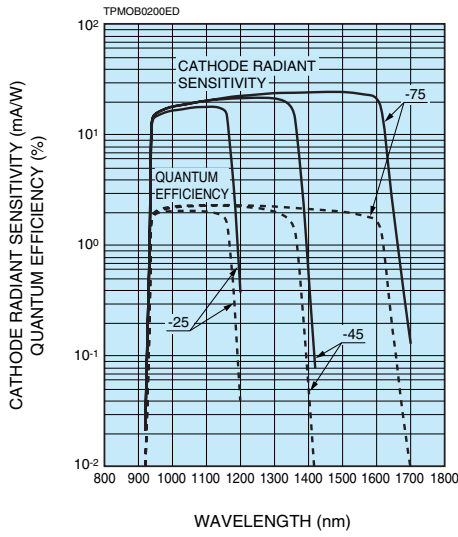
## GATE CHARACTERISTICS

Parameter	H12694-25, H12694-45, H12694-75	Unit
Gate Mode	Normally OFF	—
Delay Time	150	ns
Rise Time	40	ns
Fall Time	85	ns
Gate Width	1 to $1.0 \times 10^4$	$\mu$ s
Repetition Rate	Max. 10	kHz
Duty Ratio	Max. 90 (ON)	%
Gate Signal Input	Input Impedance	500
	Low Level	0 to 0.4
	High Level	2.0 to 15

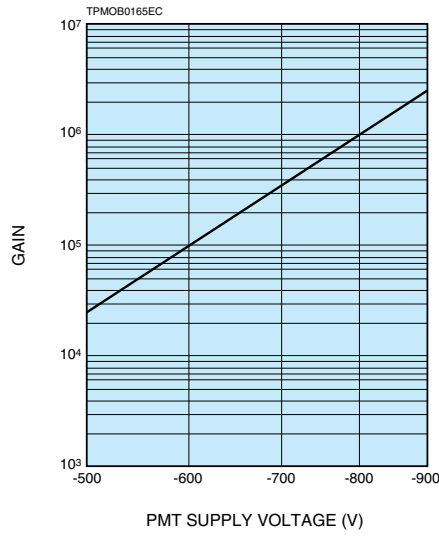
\* Measurement needs to be taken to avoid gate switching noise (400 ns) described in the next page.

# CHARACTERISTICS (When gate is ON)

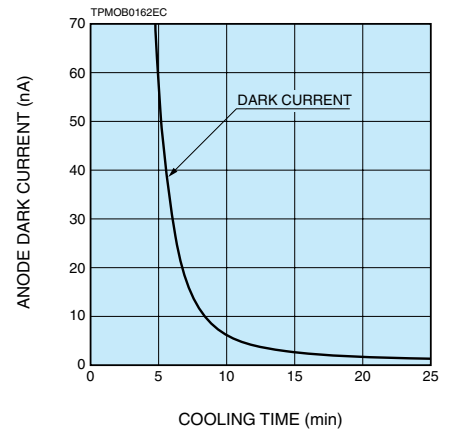
## ●Spectral Response



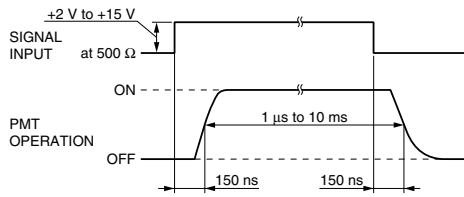
## ●Typical Gain



## ●Dark Current vs. Cooling Time (H12694-45)

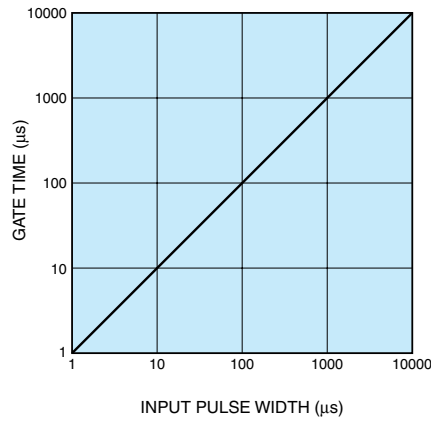


## ●Gate Timing Chart (at +25 °C)

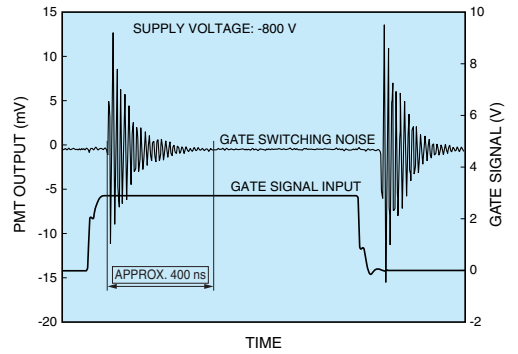


## ●Gate Time Characteristics

### Gate Time V.S. Input Pulse Width

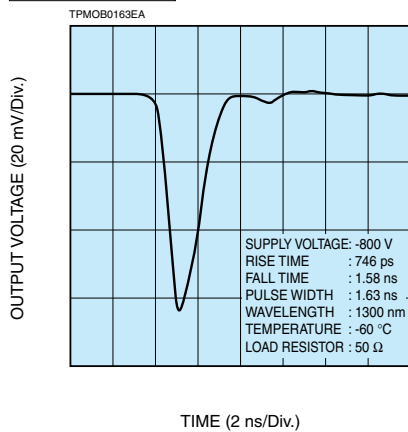


### Gate Switching Noise (H12694-75)

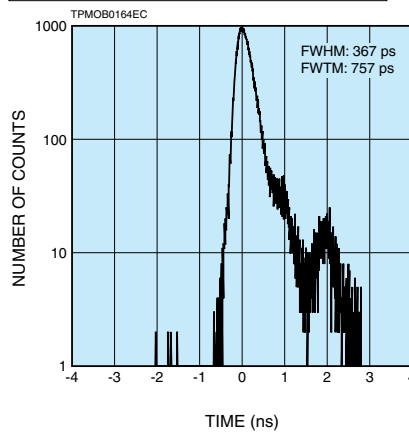


## ●Timing Properties

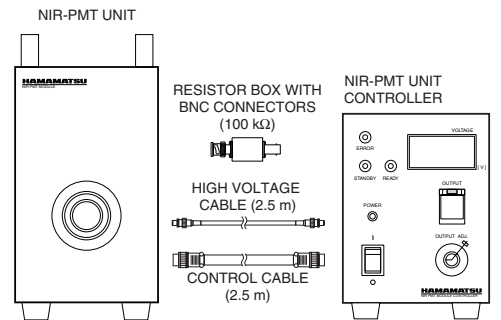
### Waveform



### Transit Time Spread (T.T.S.)



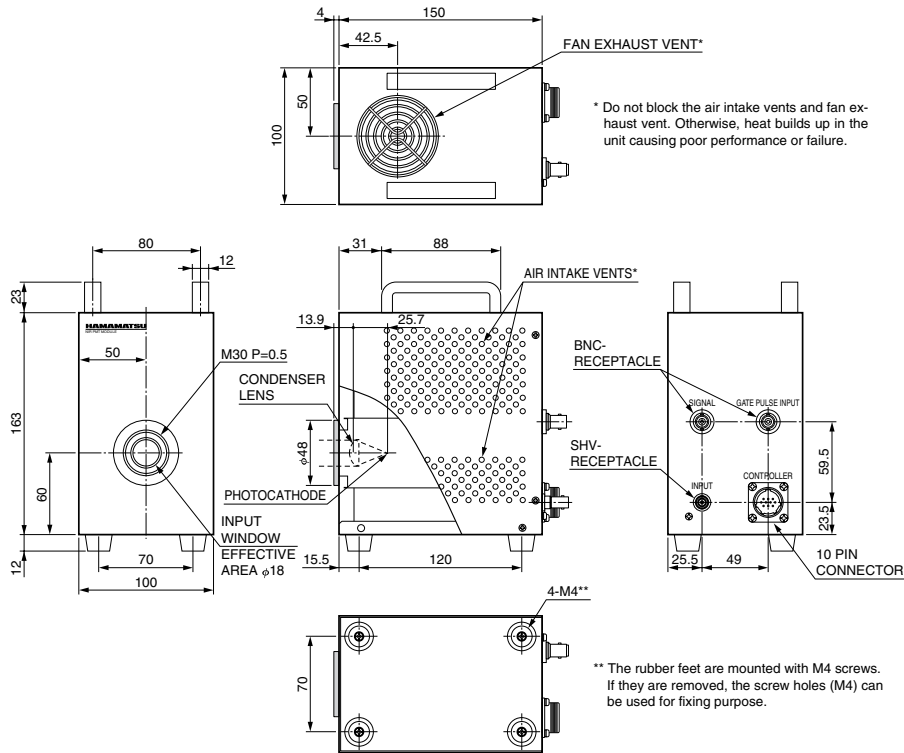
## SYSTEM CONFIGURATION (CONNECTION DIAGRAM)



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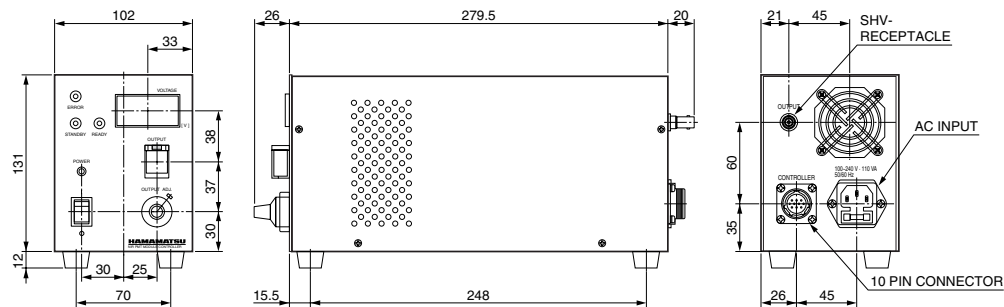
# DIMENSIONAL OUTLINES (Unit: mm)

## ●NIR-PMT Unit



TPMOA0040EC

## ●NIR-PMT Unit Controller



TPMOA0041EC

# OPTIONS (sold separately)

Adapters to match optical fiber connectors or monochromators are available.

### ●Optical Fiber Adapters

These adapters allow light from an optical fiber to efficiently enter the PMT. Specify an FC type or SMA type adapter when ordering.

### ●Monochromator Adapter

The adapter collects light from a monochromator efficiently. Please inform us of the type of the monochromator.

### ●Resistor Box with BNC Connectors

A 50 Ω resistor box with BNC connectors is available.

Use the 100 kΩ resistor box (supplied with H12694 series) for use with a lock-in amplifier.

\*Please contact your local Hamamatsu office for any assistance.

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