

### FEATURES

- High-speed response
- High time resolution
- High sensitivity
- Directly connects to the HPD power supply (R10467U-xx-01, R11322U-40-01, H13223-40)

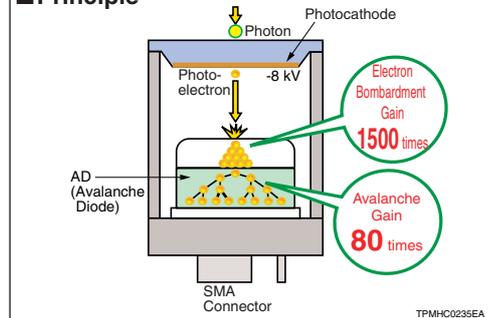
### APPLICATIONS

- Laser scanning microscope (Confocal / Two-photon)
- FCS (Fluorescence Correlation Spectroscopy)
- LIDAR (Light Detection and Ranging)
- TCSPC (Time-correlated Single Photon Counting)



Left: R10467U-40, Center: R11322U-40, Right: H13223-40

#### Principle



### SPECIFICATIONS

#### GENERAL

Parameter		R10467U-06	R11322U-40	R10467U-40 H13223-40	R10467U-50	Unit
Spectral response		220 to 650	300 to 720	300 to 720	380 to 890	nm
Photocathode	Material	Bialkali	GaAsP	GaAsP	GaAs	—
	Effective area	φ6	φ5	φ3	φ3	mm
Window material		Synthetic silica	Borosilicate glass			—
Window type		Plano-concave	Flat			—
Operating ambient temperature			+15 to +35		°C	
Storage temperature			0 to +40		°C	

#### MAXIMUM RATINGS

Parameter	Value	Unit
Photocathode voltage	-8500	V
Avalanche diode (AD) reverse bias voltage	V <sub>b</sub> -10 <sup>*1</sup>	V
Average photocathode current	200	pA

\*1: V<sub>b</sub> is the AD bias voltage at the leakage current 1 μA. The voltage of V<sub>b</sub> is from 300 V to 500 V.

#### SPECIFICATIONS (Typ.)

Parameter	Description / Value	Unit
Quantum efficiency	28 <sup>*4</sup> 45 <sup>*5</sup> 45 <sup>*5</sup> 14 <sup>*6</sup>	%
Gain <sup>*2</sup>	1.2 × 10 <sup>5</sup>	—
Time response	Rise time	400 ps
	Fall time	400 ps
	Width	600 ps
T.T.S. (Transit Time Spread) <sup>*3</sup>	FWHM	50    170    90    130 ps

\*2: At the photocathode voltage of -8 kV and the AD bias voltage of V<sub>b</sub> (breakdown voltage) -10 V.

\*3: At the single photon state and the full illumination on photocathode, specified as FWHM (Full Width at Half Maximum).

These values include the jitter of the electronics about 30 ps.

\*4: At 350 nm    \*5: At 500 nm    \*6: At 800 nm

# HIGH SPEED COMPACT HPD (Hybrid Photo Detector) SERIES

## R10467U SERIES / R11322U-40 / H13223-40

Figure 1: Quantum efficiency

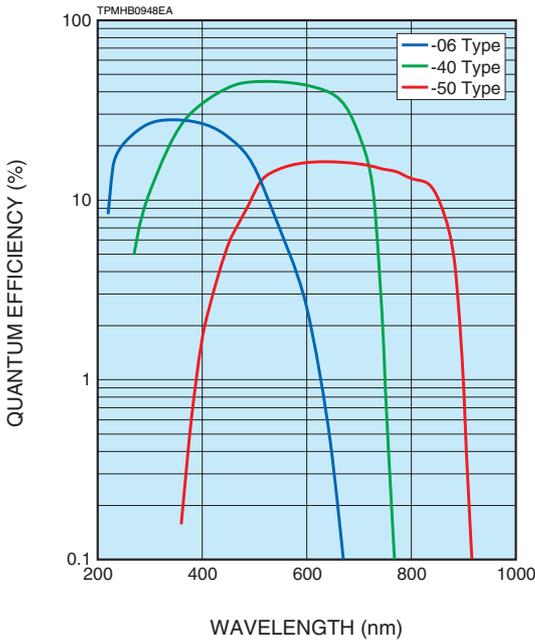


Figure 2: Output waveform (multi-photoelectron state)

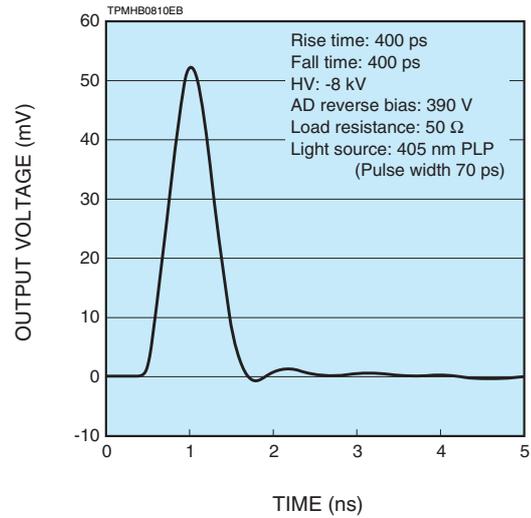


Figure 3: Gain

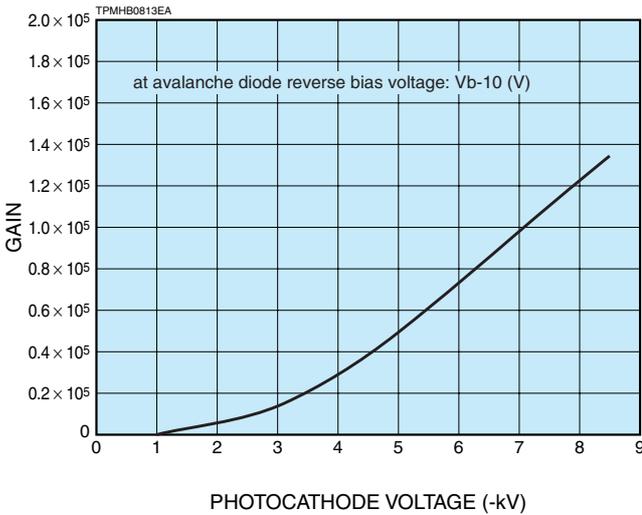


Figure 4: Breakdown voltage vs. temperature

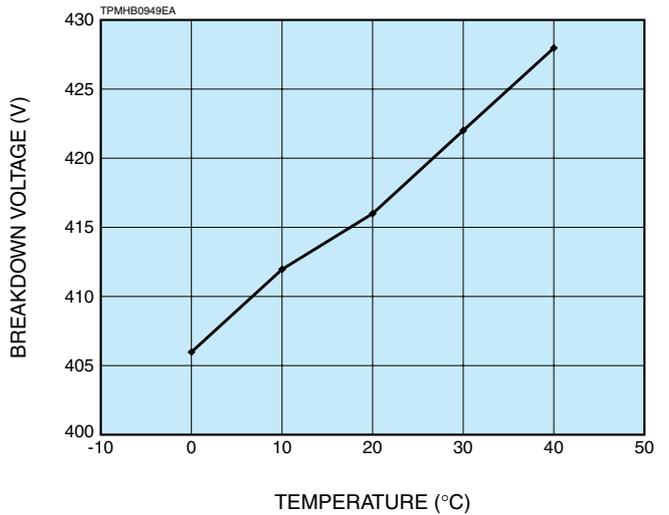


Figure 5: Dimensional outline

(R10467 series, R11322U-40) (Unit: mm)

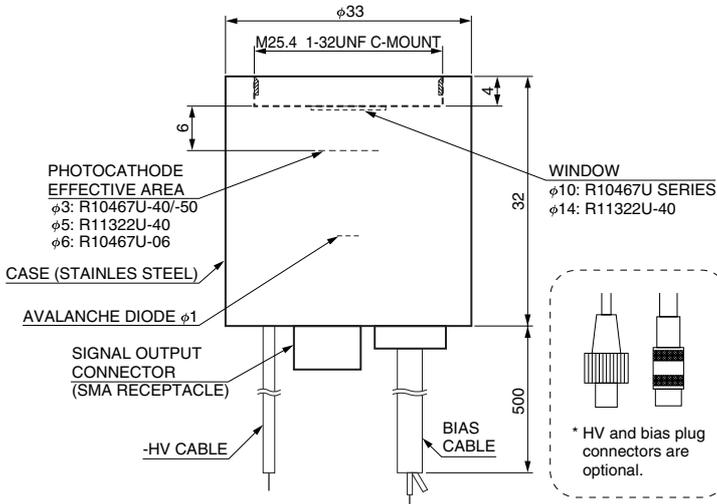
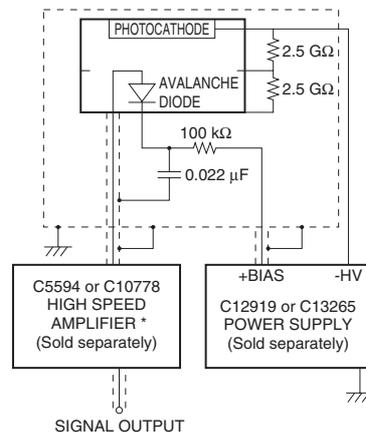


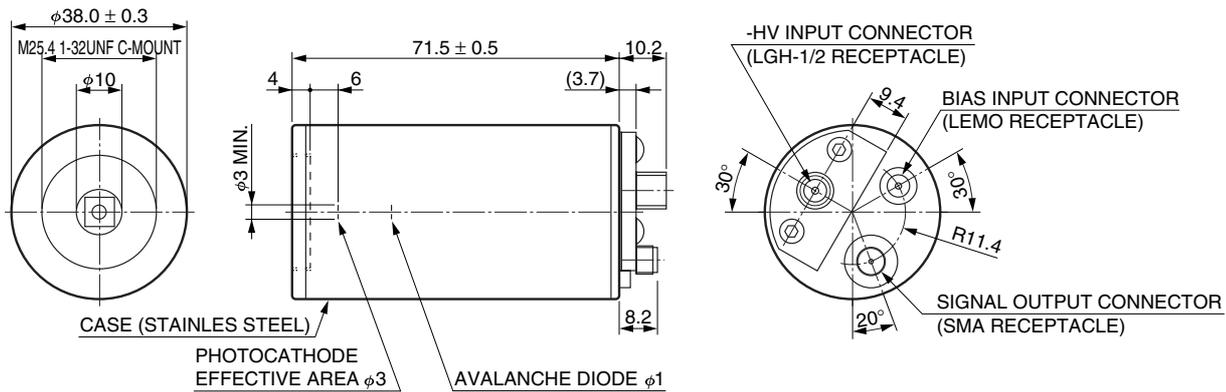
Figure 6: Block diagram

(R10467U series, R11322U-40)

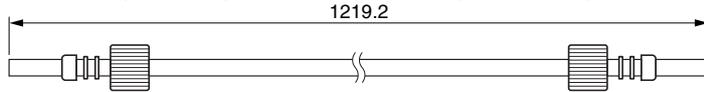


\* HV and bias plug connectors (AMP P/N 830611, LEMO FFA.00.250.CTAC29) fitting each female connector on C12929 can be attached to the R10467U series /R11322U-40 on request as an option. The R10467U-xx-01 and R11322U-40-01 are equipped with these connectors.

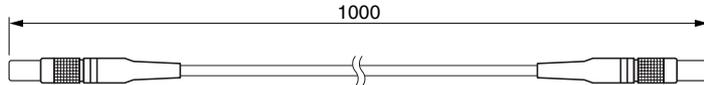
Figure 7: Dimensional outline (H13223-40) (Unit: mm)



- -HV CABLE (830612-4[TYCO ELECTRONICS], SUPPLIED)

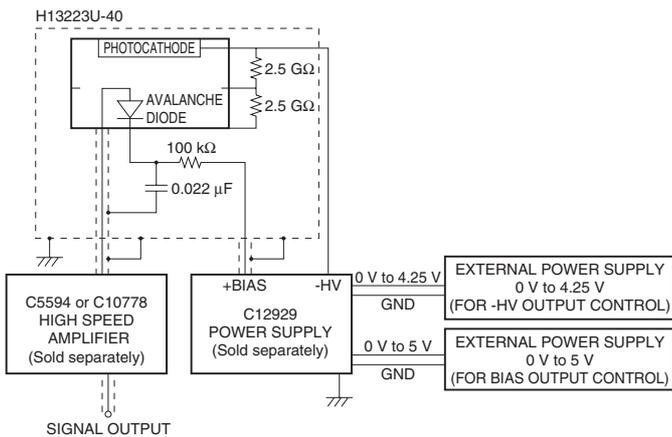


- BIAS CABLE (MSB.00.250.LTEIOO [LEMO], SUPPLIED)



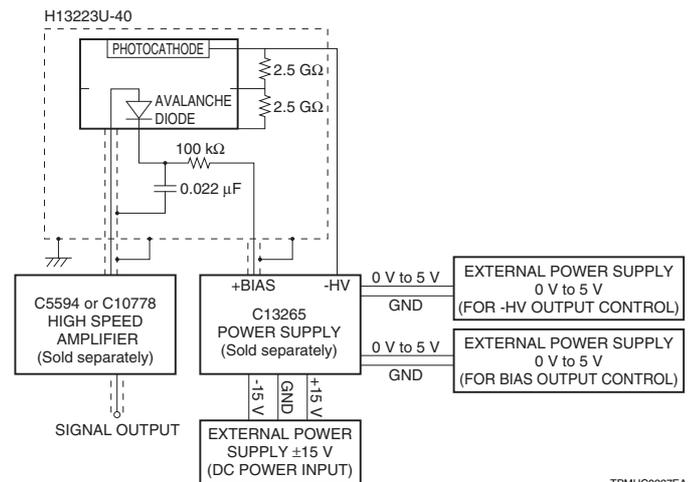
TPMH0618EA

Figure 8: Block diagram (When C12929 is used)



TPMH0226EA

Figure 9: Block diagram (When C13265 is used)



TPMH0227EA

## RELATED PRODUCTS

### HIGH SPEED AMPLIFIER C5594 HIGH SPEED INVERTING AMPLIFIER C10778

## SPECIFICATIONS

### GENERAL

Parameter	C10778	C5594	Unit
Polarity	Inverting	Non-inverting	—
Frequency	350 kHz to 1.5 GHz <sup>(A)</sup>	50 kHz to 1.5 GHz <sup>(B)</sup>	—
Gain	Min.	34 <sup>(C)</sup>	dB
	Typ.	37 <sup>(C)</sup>	dB
Input / Output impedance	50	50	Ω
Supply voltage	+7 to +12	+12 to +16	V dc

**NOTE:** <sup>(A)</sup>The upper and lower cutoff frequencies are defined as the points 3 dB below the average gain over the frequency range 350 kHz to 1.5 GHz.

<sup>(B)</sup>The upper and lower cutoff frequencies are defined as the points 3 dB below the gain at 0.1 GHz.

<sup>(C)</sup>Frequency range of 350 kHz to 1.5 GHz <sup>(D)</sup>Frequency = 0.1 GHz



C10778



C5594

# HIGH SPEED COMPACT HPD (Hybrid Photo Detector) SERIES R10467U SERIES / R11322U-40 / H13223-40

## RELATED PRODUCTS

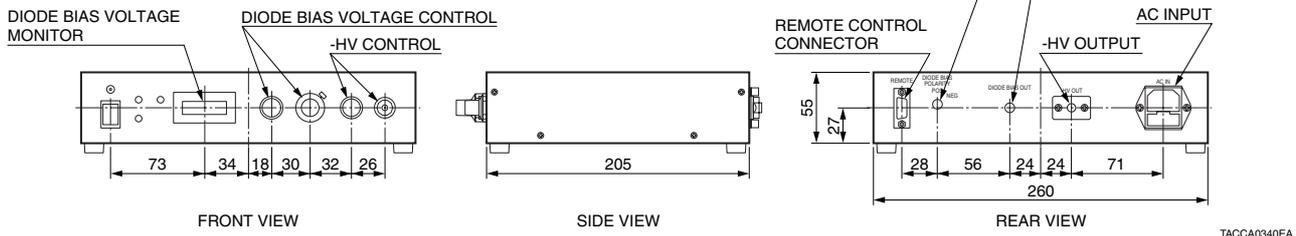
### High voltage power supply for HPD assembly C12929

The C12929 is a high voltage power supply unit for Hamamatsu R10467U/R11322U/H13223, Hybrid Photo-detector (HPD) series and its family products. The C12929 provides both photocathode high voltage and target avalanche diode reverse bias voltage which are required to operate HPDs.

For the photocathode high voltage, the C12929 can supply up to -8500 V and  $\pm 500$  V for the avalanche diode reverse bias voltage. User can control these voltages by using switches on the front panel of C12929, and inputting control voltages to the remote control connector on the backside of the C12929.



#### Dimensional outline (Unit: mm)



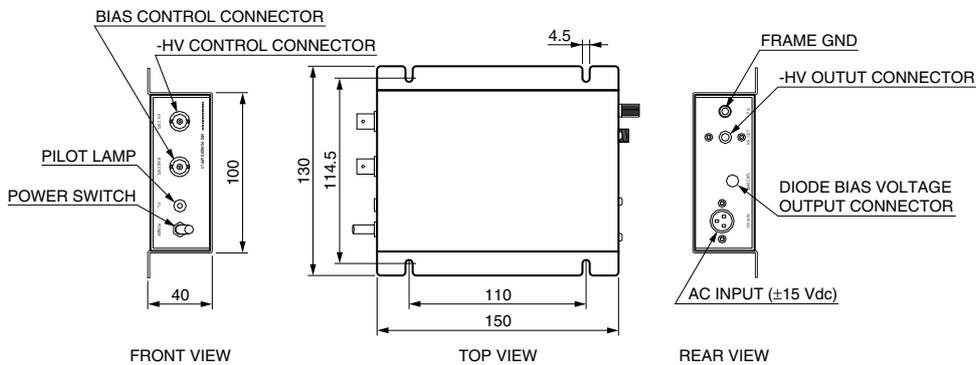
### High voltage power supply for HPD assembly C13265

The C13265 is a high voltage power supply for HPD. This is the original equipment manufacturing version. The C13265 provides both photocathode high voltage and target avalanche diode reverse bias voltage which are required to operate HPDs.

For the photocathode high voltage, the C13265 can supply up to -8500 V and +500 V for the avalanche diode reverse bias voltage. C13265 can not switch polarity of the output voltage for reverse bias voltage. User can control these voltages by inputting control voltages to the connector on the front panel of the C13265.



#### Dimensional outline (Unit: mm)



## HAMAMATSU PHOTONICS K.K. [www.hamamatsu.com](http://www.hamamatsu.com)

HAMAMATSU PHOTONICS K.K., Electron Tube Division

314-5, Shimokanzo, Iwata City, Shizuoka Pref., 438-0193, Japan, Telephone: (81)539/62-5248, Fax: (81)539/62-2205

U.S.A.: Hamamatsu Corporation: 360 Foothill Road, Bridgewater, N.J. 08807-0910, U.S.A., Telephone: (1)908-231-0960, Fax: (1)908-231-1218 E-mail: [usa@hamamatsu.com](mailto:usa@hamamatsu.com)

Germany: Hamamatsu Photonics Deutschland GmbH: Arzbergerstr. 10, D-82211 Herrsching am Ammersee, Germany, Telephone: (49)8152-375-0, Fax: (49)8152-2658 E-mail: [info@hamamatsu.de](mailto:info@hamamatsu.de)

France: Hamamatsu Photonics France S.A.R.L.: 19, Rue du Saule Trappu, Parc du Moulin de Massy, 91882 Massy Cedex, France, Telephone: (33)1 69 53 71 00, Fax: (33)1 69 53 71 10 E-mail: [infos@hamamatsu.fr](mailto:infos@hamamatsu.fr)

United Kingdom: Hamamatsu Photonics UK Limited: 2 Howard Court, 10 Tewin Road, Welwyn Garden City, Hertfordshire AL7 1BW, United Kingdom, Telephone: (44)1707-294888, Fax: (44)1707-325777 E-mail: [info@hamamatsu.co.uk](mailto:info@hamamatsu.co.uk)

North Europe: Hamamatsu Photonics Norden AB: Torshamnsgatan 35 SE-164 40 Kista, Sweden, Telephone: (46)8-509-031-00, Fax: (46)8-509-031-01 E-mail: [info@hamamatsu.se](mailto:info@hamamatsu.se)

Italy: Hamamatsu Photonics Italia S.r.l.: Strada della Moia, 1 int. 6, 20020 Arese (Milano), Italy, Telephone: (39)02-93581733, Fax: (39)02-93581741 E-mail: [info@hamamatsu.it](mailto:info@hamamatsu.it)

China: Hamamatsu Photonics (China) Co., Ltd.: B1201 Jiaming Center, No.27 Dongsanhuan Beilu, Chaoyang District, Beijing 100020, China, Telephone: (86)10-6586-6006, Fax: (86)10-6586-2866 E-mail: [hpc@hamamatsu.com.cn](mailto:hpc@hamamatsu.com.cn)

TPMH1361E01  
FEB. 2016 IP