HAMAMATSU

PRELIMINARY DATA
OCT. 2000

HPD (HYBRID PHOTO-DETECTOR) MODULES
H8236-07, -40

PATENT PENDING

The HPD (Hybrid Photo-Detector) is a new vacuum photo-detector including a photocathode and an avalanche diode. The HPD provides a gain of more than 1000 in a single multiplication process called 'electron bombardment multiplication'. The photoelectrons from the photocathode are accelerated by a strong electric field to hit the avalanche diode and release a large number of electron-hole pairs corresponding to the acceleration energy. This excellent first multiplication process enables the HPD to achieve excellent multi-photon energy resolution. This first multiplication process is followed by the second avalanche mode multiplication to provide sufficient gain for a variety of applications.
H8236 is an HPD module, containing high voltage power supplies and a pre-amplifier.

FEATURES

- **Able to discriminate multi-photon events**
- **Low excess noise**
- **High Q.E. from 450 nm to 650 nm (H8236-40)**
- **Simple operation**
  Built-in high voltage power supply and pre-amplifier
- **Low after pulse**

APPLICATIONS

- **Photon counting application**
- **Low intensity pulse detection**
- **Laser scanning microscope**
- **Particle counter**

SPECIFICATIONS

Parameter			H8236-07	H8236-40	Unit
Spectral Response			160 to 850	350 to 720	nm
Peak Sensitivity Wavelength			420	550	nm
Photocathode Material			Multialkali	GaAsP(Cs)	—
Quantum Efficiency Ⓔ			15	40	%
Effective Area			ϕ8	ϕ5	mm Min.
Sensitivity Ⓐ			0.2 Ⓔ	0.7 Ⓔ	V/nW
			6 mV/1 photoelectron		—
Bandwidth			DC to 3.5 MHz		—
Signal Output	Offset (Typ.)		-0.7		V dc
	Noise r.m.s. (Typ.)		1		mV
	Load Impedance	AC coupled	more than 50		Ω
		DC coupled	more than 5		kΩ
	Maximum Voltage		-5		V Max.
	Polarity		Negative		—
Input Power/Current	To Pre-amplifier (PIN 2)		-12 V dc/6 mA		—
	To Diode Bias Power Supply (PIN 4)		+12 V dc/50 mA		—
Recommended Control Voltage Range	To High Voltage (PIN 8)		+3 to +8 Ⓑ		V dc
	To Diode Bias Voltage (PIN 6)		+3.5 to +7.6 ⓒⒹ		V dc
Signal Connector			BNC-R		—
Control Connector			12-pin connector (Hirose: HR10A-10R-12P)		—
Weight			Approx. 370		g

MAXIMUM RATINGS (Absolute Maximum Value)

Input Power	PIN 2	-12.5		V dc
	PIN 4	+16		V dc
Control Voltage	PIN 8	+8.5		V dc
	PIN 6	Ⓓ		—
Operating Ambient Temperature		0 to +40		°C
Operating Humidity		90 Ⓕ		%RH
Average Input Light Power Ⓔ		4	1	nW
Peak Input Light Power ⒺⒼ		380	105	nW

NOTE: Ⓐ at 8 V (or set the HV knob to -8 kV on the front panel of the HPD module power supply C8237) to PIN 8 and 7.5 V (or set the C8237 diode bias voltage to +150 V) to PIN 6
Ⓑ or "-3 kV" to "-8 kV" high voltage on the C8237 front panel
Ⓒ or "70 V" to "152 V" diode bias voltage on the C8237 front panel
Ⓓ The characteristics of the bias voltage vs. avalanche gain curve of the diode inside are affected by the ambient temperature conditions, and even under the same ambient temperature conditions resulting curve may differ between diodes from different production lots. Refer to the individual data sheet attached to the module. Ⓔ at peak sensitivity wavelength Ⓕ without moisture condensation
Ⓖ at 3 V (or set the C8237 HV knob to -3 kV) to PIN 8 and 7.5 V (or set the C8237 diode bias voltage to +150 V) to PIN 6. Input light pulse: 50 ns (FWHM), 200 kHz.

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Figure 1: Measurement Set-up Example

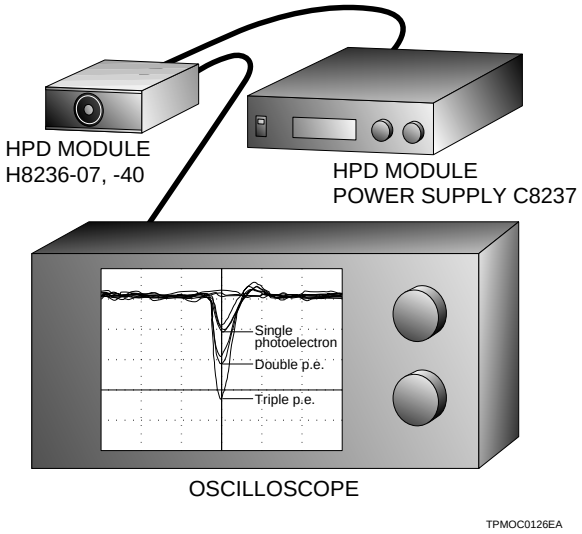


Figure 2: Multi-photoelectron Pulse Height Distribution

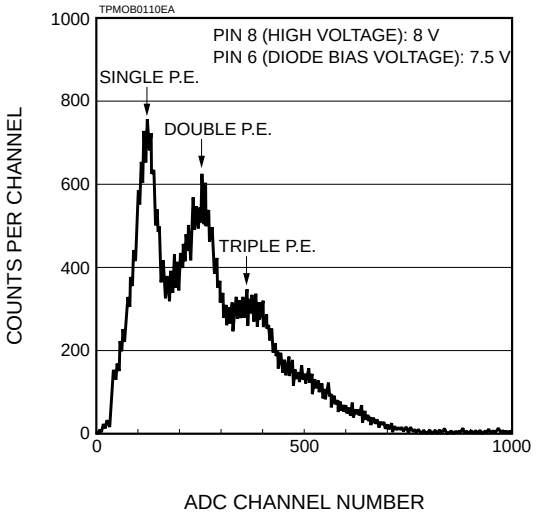


Figure 3: Typical Spectral Response

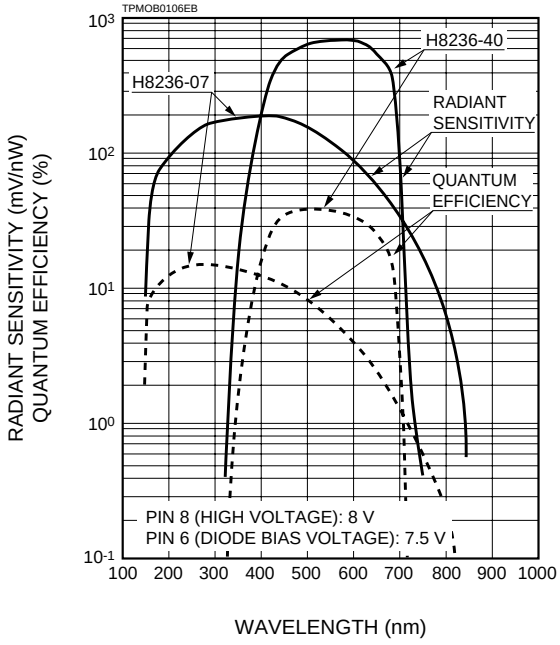
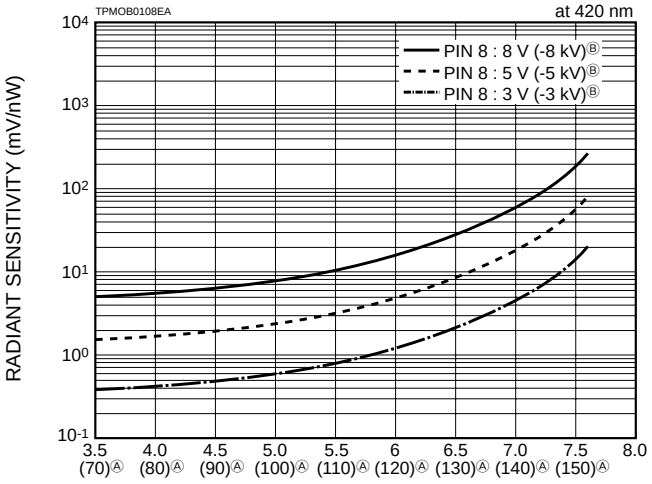
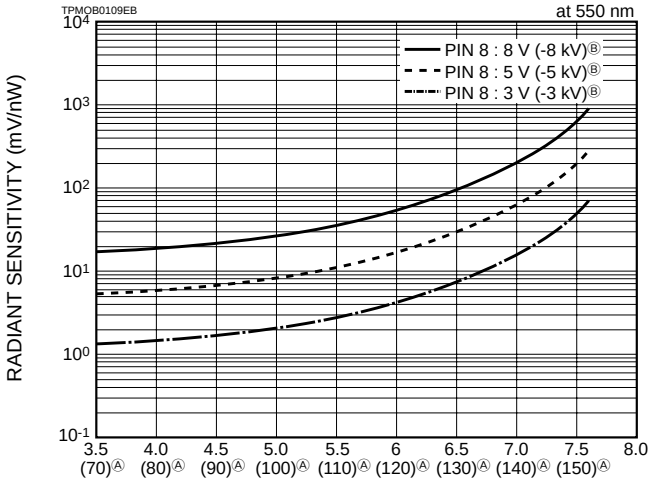


Figure 4: PIN 6: Diode Bias Voltage vs. Radiant Sensitivity

H8236-07



H8236-40



* Ⓐ: set the C8237 diode bias voltage
Ⓑ: set the C8237 HV

Figure 5: Internal Block Diagram

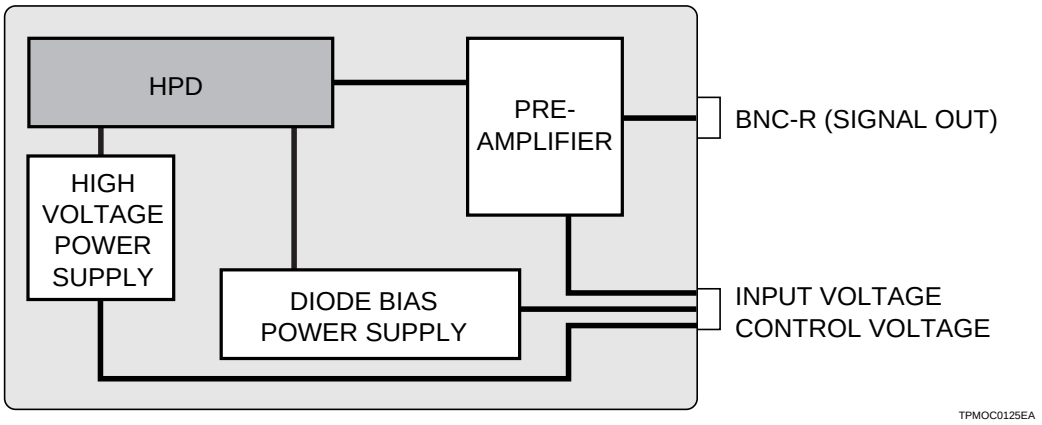
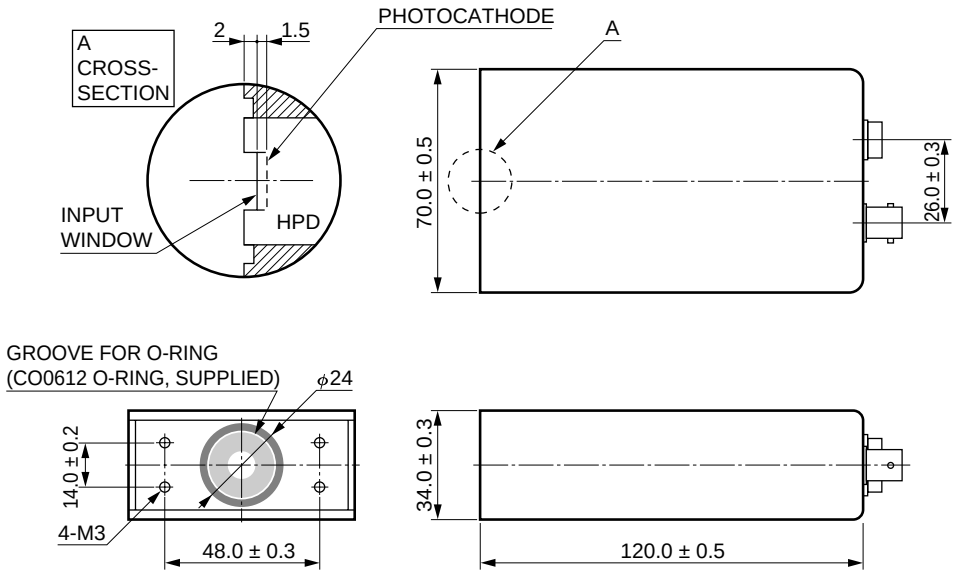
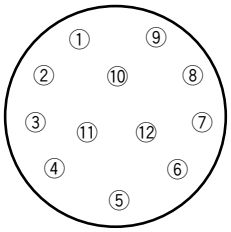


Figure 6: Dimensional Outline (Unit: mm)



CONNECTION (12-PIN CONNECTOR)



① NC
② -12 V (6 mA)
③ GND
④ +12 V (50 mA)
⑤ GND
⑥ 0 to +7.6 V
(DIODE BIAS VOLTAGE: 0 to +152 V)
⑦ GND
⑧ 0 to +8.5 V
(HIGH VOLTAGE: 0 to -8.5 kV)
⑨ GND
⑩ DIODE BIAS MONITOR OUTPUT
⑪ GND
⑫ NC

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NOTE

Keep the input window at least 7 mm away from the ground potential during use.

HPD MODULE CONTROL UNIT C8237 (OPTIONAL)

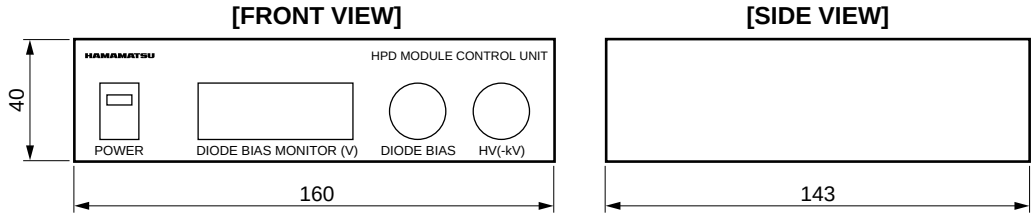
The C8237 HPD module power supply unit converts ac power to the dc voltages to be used with H8236 series.
Control knobs on the front panel adjust the diode bias voltage and the high voltage that determine the module gain.

SPECIFICATIONS

Input		85 to 240 V ac
Output	to Pre-Amplifier	-12 V dc, +12 V dc *
	to Diode Bias Power Supply	+12 V dc
	to High Voltage Control	0 to +8.5 V dc (0, 1, 2, 3, 4, 5, 6, 7, 8, 8.5 V dc)
	to Diode Bias Voltage Control	0 to +7.75 V dc (Continuously)
Connector		12-pin connector (Hirose: HR10A-10R-12P)
Connection Cable Length		1.5 m

* not to be used for H8236

Dimensional Outline (Unit: mm)



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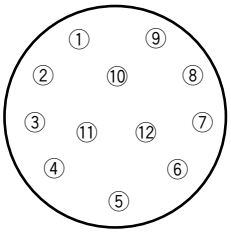

① +12 V*
② -12 V
③ GND
④ +12 V
⑤ GND
⑥ 0 to +7.75 V (to DIODE BIAS VOLTAGE: 0 to +155 V)
⑦ GND
⑧ 0 to +8.5 V (to HIGH VOLTAGE: 0 to -8.5 kV)
⑨ GND
⑩ DIODE BIAS MONITOR INPUT
⑪ GND
⑫ NC

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* not to be used for H8236

*PATENTS PENDING: JAPAN 5, USA 4, EUROPE 3

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