

This is a wide dynamic range photomultiplier tube module with 3 signal outputs. One of these outputs is digital (photon counting) for detecting single photons level light and the others are analog for detecting more intense light. By bringing together these three results measured at the same time, a dynamic range of 10 orders of magnitude can be achieved at pulsed input light conditions.



FEATURES

- Maximum counting rate: more than $5 \times 10^{11} \text{ s}^{-1}$
- DC to 20 MHz bandwidth
- Compact body
- Low dark count type

APPLICATIONS

- Atmospheric LiDAR
- Fluorescence measurement
- Chemiluminescence measurement

Figure 1: Typical spectral response

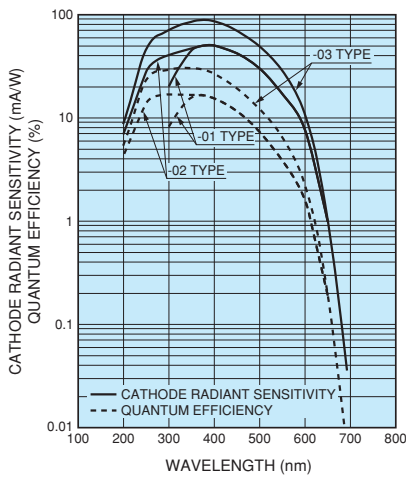


Figure 2: Block diagram

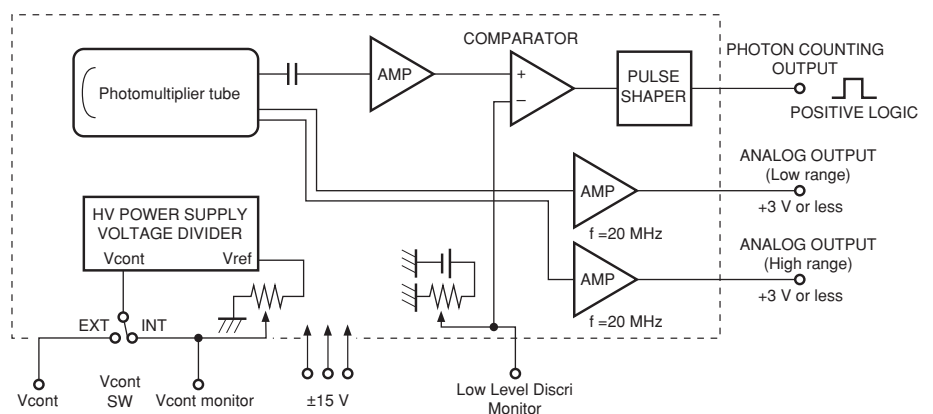
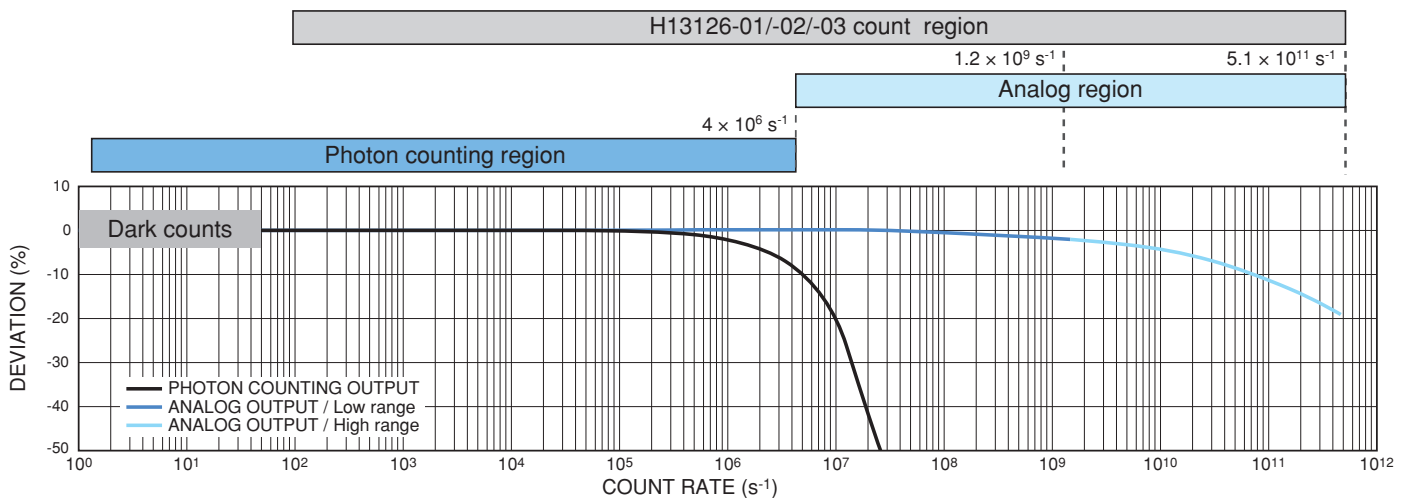


Figure 3: Measurement region



WIDE DYNAMIC RANGE PHOTOMULTIPLIER TUBE MODULES H13126-01/-02/-03

PRODUCT VARIATIONS

Type No.	Spectral response	Photocathode	Window material	Features
H13126-01	300 nm to 650 nm	Low noise bialkali	Borosilicate glass	For visible range, Low noise
H13126-02	200 nm to 650 nm	Low noise bialkali	UV glass	For UV to visible range, Low noise
H13126-03	200 nm to 650 nm	Low noise super bialkali	UV glass	For UV to visible range, High QE, Low noise

SPECIFICATIONS

(at +25 °C)

Parameter		-01	-02	-03	Unit	
Input voltage		±15			V	
Maximum input current (at ±15 V)		+200 / -50			mA	
PMT	Effective photocathode area	φ22			mm	
	Spectral response range	300 to 650	200 to 650	200 to 650	nm	
	Wavelength of maximum sensitivity	375	375	375	nm	
	Typical count sensitivity	200 nm	—	4.3×10^4	5.5×10^4	s ⁻¹ ·pW ⁻¹
		300 nm	1.3×10^5	2.5×10^5	4.4×10^5	
		400 nm	3.1×10^5	3.1×10^5	5.4×10^5	
500 nm		1.9×10^5	1.9×10^5	3.1×10^5		
600 nm	4.8×10^4	4.8×10^4	6.7×10^4			
Photon counting output	Count linearity	5×10^6			s ⁻¹	
	Dark count (Typ.) ^①	50			s ⁻¹	
	Output pulse width	8			ns	
	Output pulse height	2.5			V	
	Recommended load resistance	50			Ω	
Low range analog (AMP) output	Count-analog conversion factor	$1 \text{ V} / 4 \times 10^8 \text{ s}^{-1}$			—	
	Frequency bandwidth	DC to 20			MHz	
	Maximum output signal	+3 (at 1 kΩ load)			V	
	Output offset	±1			mV	
	DC linearity ^②	±2.5			%	
	Output impedance	50			Ω	
High range analog (AMP) output	Count-analog conversion factor	$1 \text{ V} / 1.7 \times 10^{11} \text{ s}^{-1}$			—	
	Frequency bandwidth	DC to 20			MHz	
	Maximum output signal ^③	+3 (at 1 kΩ load)			V	
	Output offset	±1			mV	
	DC linearity ^②	±20			%	
	Output impedance	50			Ω	
Operating ambient temperature ^④		+5 to +40			°C	
Storage temperature ^④		-20 to +50			°C	
Weight		400			g	
Cable length		1000			mm	

- NOTE:** ① Measured after 3 h storage in the dark.
 ② Total 10 digit linearity of photon counting to analog output is within ±20 %.
 ③ Pulse output only when 40 mV or more.
 ④ No condensation

CONVERSION TABLE TO COUNT VALUE

Analog output / Low range

Analog output (V)	Count (s ⁻¹)	Frequency (MHz)	Count at 50 ns
3	1.2×10^9	1200	60.0
2	8×10^8	800	40.0
1	4×10^8	400	20.0
0.5	2×10^8	200	10.0
0.1	4×10^7	40	2.0
0.05	2×10^7	20	1.0
0.01	4×10^6	4	0.2
0.005	2×10^6	2	0.1
0.001	4×10^5	0.4	0.02

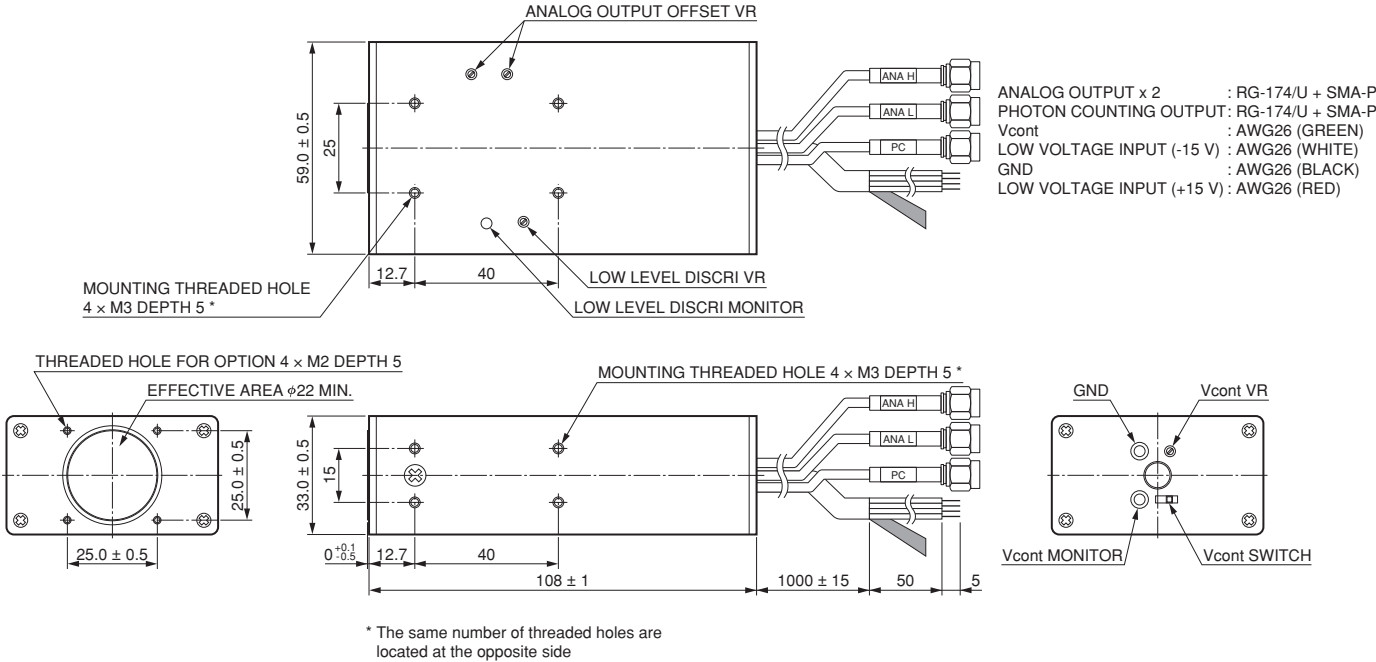
Example) ADC sampling rate: 20 MHz (50 ns)
 · Analog output = 2.25 V
 → Count data = 44.0 (2.2 V) + 1.0 (0.05 V) = 45 count / 50 ns

Analog output / High range

Analog output (V)	Count (s ⁻¹)	Frequency (GHz)	Count at 50 ns
3	5.1×10^{11}	510	25 500
2	3.4×10^{11}	340	17 000
1	1.7×10^{11}	170	8500
0.5	8.5×10^{10}	85	4250
0.1	1.7×10^{10}	17	850
0.05	8.5×10^9	8.5	425
0.01	1.7×10^9	1.7	85
0.005	8.5×10^8	0.85	42.5
0.001	1.7×10^8	0.17	8.5

Example) ADC sampling rate: 20 MHz (50 ns)
 · Analog output = 1.75 V
 → Count data = 14 450 (1.7 V) + 425 (0.05 V) = 14 875 count / 50 ns

Figure 4: Dimensional outline (Unit: mm)



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TPMO1116E03
OCT. 2022 IP