AMAMATSU PHOTON IS OUR BUSINESS

APD modules



C12703 series

APD module integrated with peripheral circuits

Features

- Uses a high sensitivity APD Two types of APDs with different photosensitive areas (φ1.5 mm, φ3.0 mm) are provided.
- On-board high sensitivity circuit optimized for APD evaluation. An APD and a low-noise current-to-voltage amplifier circuit are mounted on a compact PC board. The current-to-voltage amplifier circuit features a lownoise configuration allowing low-light-level detection.
- Detects optical signals from fixed light (DC light) The C12703 detects optical signals from fixed light (DC light) to 10 MHz pulsed light making it well suited for bar code readers and film scanners. The C12703-01 covers a narrower bandwidth from fixed light (DC light) to 100 kHz pulsed light, but provides an excellent NEP of 20 fW/Hz^{1/2}, in the room temperature, making it suitable for fluorescence measurement and particle counters where low-light-level detection is essential.
- Built-in temperature-compensated bias power supply. The bias power supply is controlled with a thermosensor to keep the APD gain constant. Gain variations are typically held within ±2.5% at an ambient temperature of 25 ±10 °C. Ripple noise usually inherent to high-voltage power supplies is also minimized.
- Compact and lightweight The board is no larger than a typical business card.
- Custom designed module with different dimensions and specifications are available.

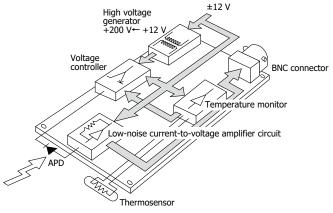
Applications

- Evaluation of APD
- → Fluorescence measurement
- **■** Bar code readers
- → Particle counters
- Film scanners

Selection guide

Type no.	Photosensitive area (mm)	Photosensitivity (V/W)	Frequency bandwidth (Hz)
C12703	ф1.5	1.5×10^{6}	DC to 10 M
C12703-01	ф3.0	-1.5×10^{8}	DC to 100 k

Block diagram



⇒ Structure / Absolute maximum ratings (Ta=25 °C)

Power supply			nnly	Current				Absolute maximum ratings							
		Vs		Vs		Vs (V) ±12 V			Board	Weight	Positive	Negative	Maximum	Operating	Storage
Type no.	Condition							dimensions	Weight	supply voltage	supply voltage	incident	temperature	temperature	
				(m	A)			Vp	Vn	light level	Topr	Tstg			
		Min.	Тур.	Max.	Тур.	Max.	(mm)	(g)	(V)	(V)	(mW)	(°C)	(°C)		
C12703	+12 V	+11.4	+12	+12.6	+30	+45									
C12/03	-12 V	-11.4 -12 -12.6		-12.6	-11	-16	00 v E0 v 22	20	.16	1.0	10	0 +	20 +- + 70		
C12703-01	+12 V	+11.4	+12	+12.6	+35	+45	80 × 50 × 22	38	+16	-16	10	0 to +60	-20 to +70		
C12/03-01	-12 V	-11.4	-12	-12.6	-11	-16									

■ Electrical and optical characteristics (Typ. Ta=25 °C, Vcc=± 12 V, unless otherwise noted)

■ Photoelectric section (APD)

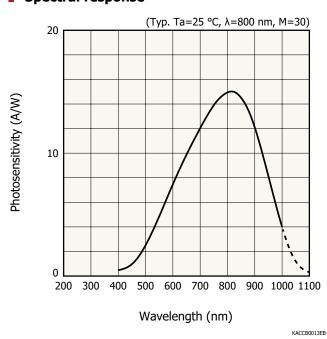
Type no.	Spectral response range λ	Peak sensitivity wavelength λp	Photosensitivity S λ=800 nm, Gain(M)=1	Temperature stability of gain*1 25 °C ± 10 °C, M=30 (%)						
	(nm)	(nm)	(A/W)	Тур.	Max.					
C12703	400 to 1000	800	0.5	±2.5	±5					
C12703-01	700 (0 1000	000	0.5							

■ High-speed amplifier section

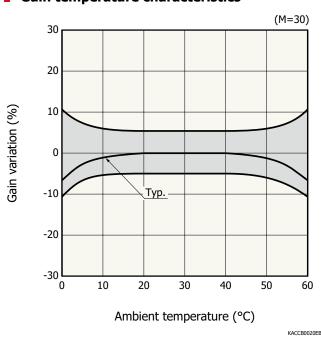
Type no.		ff frequ fc -3 dB (Hz) band	iency	NI f=10 MHz f=100 kHz (λ=80	ise equivalent power NEP 10 MHz (C12703) 100 kHz (C12703-01) λ=800 nm (pW/Hz ^{1/2})		Latter-stage amplifier gain	Ir	Photoelectric sensitivity*1 Including APD λ =800 nm M =30 (V/W)			Maximum input light level (uW)		Minimum detection limit (nW rms)	
	Min.	Тур.	band	Typ.	Max.	(Ω)		Min.	Typ.	Max.	Min.	Тур.	Typ.	Max.	
C12703	9 M	10 M	DC	0.2	0.4	10 k	-10	1.4×10^{6}	1.5×10^{6}	1.6×10^{6}	5.0	6.0	0.63	1.26	
C12703-01	80 k	100 k	DC	0.02	0.04	10 M	-	-1.4×10^{8}	-1.5×10^{8}	-1.6×10^{8}	0.05	0.06	0.0063	0.013	

^{*1:} Gain is set to 30 at the factory prior to shipping.

Spectral response

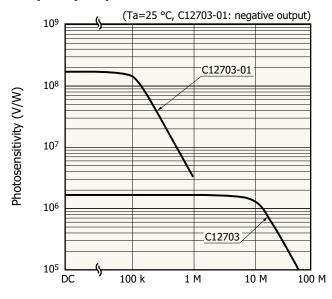


Gain temperature characteristics





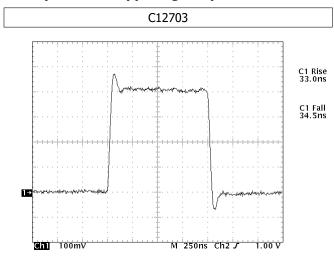
- Frequency response



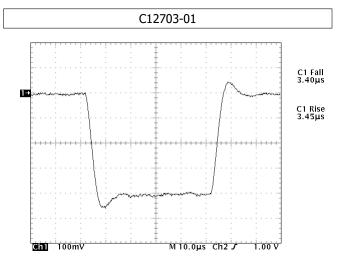
Frequency (Hz)

KACCB0339EA

Response to stepped light input

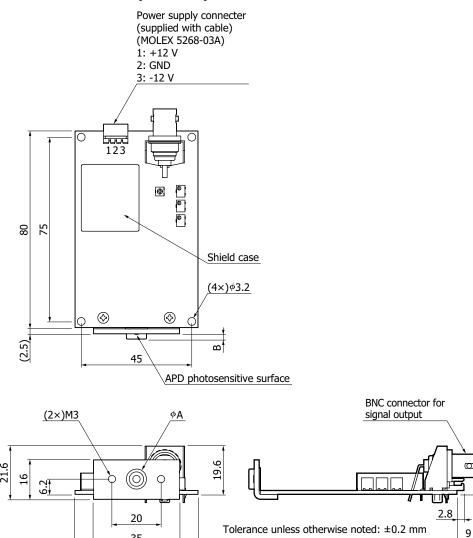


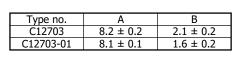
Ta=25 °C, gain=30, input pulse width=1 μ s X-axis: 250 ns/div., Y-axis: 100 mV/div.



Ta=25 °C, gain=30, input pulse width=50 μ s X-axis: 10 μ s/div., Y-axis: 100 mV/div.

Dimensional outline (unit: mm)





KACCA0323E

Accessories

- $\cdot \ \text{Power supply cable} \\$
- · CD-ROM (Instruction manual)

35 50

Option (sold separately)

Fiber adapter A8407/A8424 series

The A8407/A8424 series fiber adapters are designed to couple the APD module to an optical fiber. Two types are available for FC and SMA connectors. Using this adapter allows efficiently coupling the APD module to a GI-50/125 multi-mode fiber. This adapter screws on for easy attachment.

Note: Optical fiber is needed separately.





A8407 series (FC type)

A8424 series (SMA type)

APD module	Fiber adapter (FC type)	Fiber adapter (SMA type)			
C12703	A8407-05	A8424-05			
C12703-01	A8407-05A	A8424-05A			

Precaution

- (1) This product incorporates a high-voltage power supply. To prevent electrical hazards, do not remove the mold material.
- (2) Recommended termination resistance for this module is from 10 k Ω to 1 M Ω . Terminating with a low-resistance resistor such as 50Ω affects the output drive capacity, and may cause poor linearity.

Related information

www.hamamatsu.com/sp/ssd/doc_en.html

- Precautions
- · Disclaimer

Information described in this material is current as of August 2023.

Product specifications are subject to change without prior notice due to improvements or other reasons. This document has been carefully prepared and the information contained is believed to be accurate. In rare cases, however, there may be inaccuracies such as text errors. Before using these products, always contact us for the delivery specification sheet to check the latest specifications.

The product warranty is valid for one year after delivery and is limited to product repair or replacement for defects discovered and reported to us within that one year period. However, even if within the warranty period we accept absolutely no liability for any loss caused by natural disasters or improper product use. Copying or reprinting the contents described in this material in whole or in part is prohibited without our prior permission.

MAMATSU

www.hamamatsu.com

HAMAMATSU PHOTONICS K.K., Solid State Division

1126-1 Ichino-cho, Higashi-ku, Hamamatsu City, 435-8558 Japan, Telephone: (81)53-434-3311, Fax: (81)53-434-5184

ILIZO-I ICHINIO-CIRO, RIGIDASI II-RU, FIDATINITIALISU CIRO, FOST-OSOS JAPAIN, Telephrone: (1)908-231-0960, Fax: (1)908-231-1218

Germany: HAMAMATSU CROPORATION: 360 Footbill Road, Bridgewater, NJ 08807, U.S.A., Telephone: (1)908-231-0960, Fax: (1)908-231-1218

Germany: HAMAMATSU PHOTONICS DEUTSCHLAND GMBH: Arzbergerstr. 10, 82211 Herrsching am Ammersee, Germany, Telephone: (49)8152-375-0, Fax: (49)8152-265-8 E-mail: info@hamamatsu.de

France: HAMAMATSU PHOTONICS FRANCE S.A.R.L.: 19 Rue du Saule Trapu, 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: info@hamamatsu.df

United Kingdom: HAMAMATSU PHOTONICS UK LIMITED: 2 Howard Court, 10 Tewin Road, Welwyn Garden City, Hertfordshire, AL7 18My, UK, Telephone: (44)1707-294888, Fax: (44)1707-325777 E-mail: info@hamamatsu.co.uk

North Europe: HAMAMATSU PHOTONICS NORDEN AB: Torshamnsgatan 35, 16440 Kista, Sweden, Telephone: (46)8-509-031-01, Fax: (46)8-509-031-01 E-mail: info@hamamatsu.se

Italy: HAMAMATSU PHOTONICS (TAILA S.R.L.: Strada della Moia, 1 int. 6 20044 Arese (Milano), Italy, Telephone: (49)02-93 58 17 33, Fax: (39)02-93 58 17 41 E-mail: info@hamamatsu.it

China: HAMAMATSU PHOTONICS (CHINA) CO., LTD.: 1201, Tower B, Jianning Center, 27 Dongsanhuan Bellu, Chaoyang District, 100020 Beijing, PR. China, Telephone: (86)10-6586-6006, Fax: (86)10-6586-6066 E-mail: hpc@hamamatsu.com.cn

Taiwan: HAMAMATSU PHOTONICS TAIWAN CO., LTD.: 13F-1, No.101, Section 2, Gongdao 5th Road, East Dist, Hsinchu City, 300046, Taiwan(R.O.C) Telephone: (886)3-659-0080, Fax: (886)3-659-0081 E-mail: info@hamamatsu.com.cn