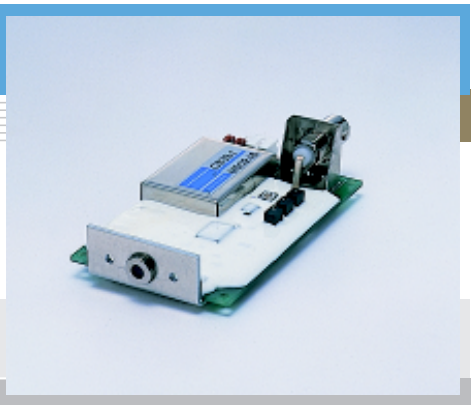
APD module
C5331 series

Operates an APD with single 5 V supply



Features

- Choice of high sensitivity APDs
  A total of 11 types are available, including 6 types of 800 nm band APDs with active areas from ϕ0.2 to ϕ5 mm, 3 types of short-wavelength APDs with active areas from ϕ1 to ϕ5 mm, and FC connector types.
- High sensitivity detection board optimized for APD evaluation
  An APD and high-speed current-to-voltage amplifier circuit are mounted on a compact board. The high-speed current-to-voltage amplifier circuit features a low-noise configuration ideal for the APD signal readout and operates at high speeds yet with high sensitivity.
- Easy handling
  Single 5 V supply operation
- Built-in temperature-compensated bias voltage circuit
  Controls the bias voltage with a thermosensor to keep the APD gain constant. Gain is stabilized to as low as ±2.5 % Typ. at ambient temperatures of 25 ±10 °C. Ripple noise usually inherent to high voltage power supplies is also minimized.
- Compact and lightweight
  The circuit board is no larger than business card size, and weighs only 52 g.
- Low price
- Custom devices available with different dimensions and specifications

Applications

- APD evaluation
- Spatial light transmission
- Bar code readers
- Laser radars
- Optical rangefinders
- Optical communications

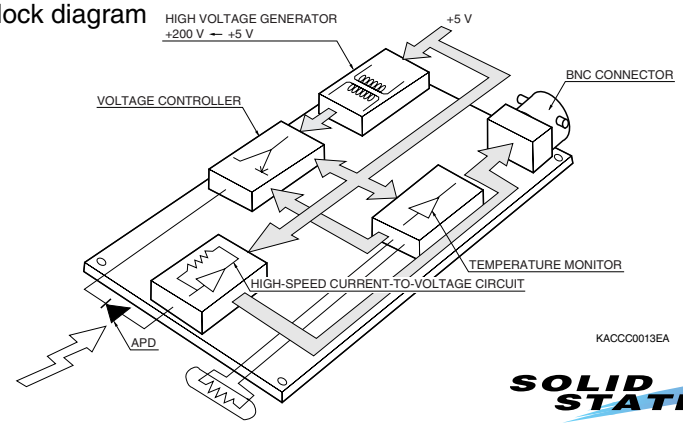
■ Selection guide

Type No.	Active area (mm)	Frequency bandwidth -3 dB (Hz)	Type of APD	Peak sensitivity wavelength (nm)
C5331	ϕ1.5	4 k to 100 M	Standard type	800
C5331-30 *1				
C5331-01	ϕ0.2			
C5331-31 *2				
C5331-02	ϕ0.5			
C5331-03	ϕ1.0			
C5331-04	ϕ3.0	4 k to 80 M		
C5331-05	ϕ5.0	4 k to 50 M		
C5331-11	ϕ1.0	4 k to 100 M	Short-wavelength type	620
C5331-12	ϕ3.0	4 k to 40 M		
C5331-13	ϕ5.0	4 k to 20 M		

*1: C5331 + FC connector
*2: C5331-01 + FC connector with lens (compatible with GI 50/125 fiber)

Note: Gain is preset to 30 prior to shipping.

■ Block diagram



SOLID STATE DIVISION

■ General ratings / Absolute maximum ratings

Type No.	Active area (mm)	Supply voltage Min. (V)	Supply voltage Typ. (V)	Supply voltage Max. (V)	Current consumption Typ. (mA)	Current consumption Max. (mA)	Board dimension (mm)	Output impedance (Ω)	Weight (g)	Absolute maximum ratings: Supply voltage (V)	Absolute maximum ratings: Operating temperature Topr (°C)	Absolute maximum ratings: Storage temperature Tstg (°C)
C5331	φ1.5	+4.75	+5	+5.25	+50	+80	80 × 50 × 23	50	52	+7	0 to +60	-55 to +100
C5331-30	φ1.5											
C5331-01	φ0.2											
C5331-31	φ0.2											
C5331-02	φ0.5											
C5331-03	φ1.0											
C5331-04	φ3.0											
C5331-05	φ5.0											
C5331-11	φ1.0											
C5331-12	φ3.0											
C5331-13	φ5.0											

■ Electrical and optical characteristics (Typ. Ta=25 °C, Vcc=5 V, unless otherwise noted)

Photoelectric converter section (APD)

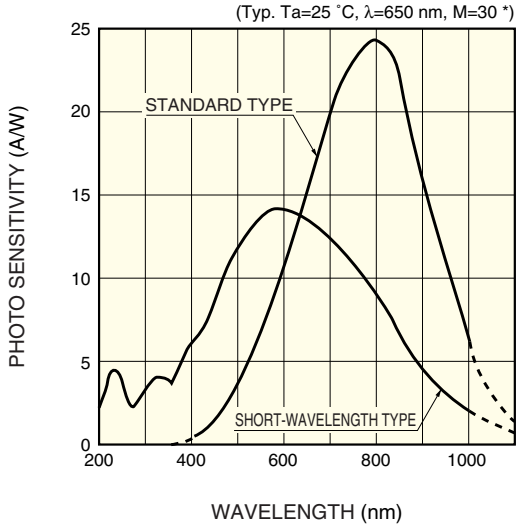
Type No.	Spectral response range λ (nm)	Peak sensitivity wavelength λp (nm)	Photo sensitivity S λ=800 nm, Gain=1 (A/W)	Photo sensitivity S λ=620 nm, Gain=1 (A/W)	Temperature stability of gain *3 25 °C ± 10 °C, Gain=30 Typ. (%)	Temperature stability of gain *3 25 °C ± 10 °C, Gain=30 Max. (%)
C5331	400 to 1000	800	0.5	-	±2.5	±5
C5331-30	400 to 1000	800	0.5	-	±2.5	±5
C5331-01	400 to 1000	800	0.5	-	±2.5	±5
C5331-31	400 to 1000	800	0.5	-	±2.5	±5
C5331-02	400 to 1000	800	0.5	-	±2.5	±5
C5331-03	400 to 1000	800	0.5	-	±2.5	±5
C5331-04	400 to 1000	800	0.5	-	±2.5	±5
C5331-05	400 to 1000	800	0.5	-	±2.5	±5
C5331-11	200 to 1000	620	-	0.42	±2.5	±5
C5331-12	200 to 1000	620	-	0.42	±2.5	±5
C5331-13	200 to 1000	620	-	0.42	±2.5	±5

High-speed amplifier section

Type No.	Cut-off frequency -3 dB: High band Min. (MHz)	High band Typ. (MHz)	Low band Min. (kHz)	Low band Typ. (kHz)	NEP: λ=800 nm Typ. (pW/Hz$^{1/2}$)	NEP: λ=800 nm Max. (pW/Hz$^{1/2}$)	NEP: λ=620 nm Typ. (pW/Hz$^{1/2}$)	NEP: λ=620 nm Max. (pW/Hz$^{1/2}$)	Feedback resistance (kΩ)	Photoelectric sensitivity *3 including APD, gain=30 Min. (10^4V/W)	Photoelectric sensitivity *3 including APD, gain=30 Typ. (10^4V/W)	Photoelectric sensitivity *3 including APD, gain=30 Max. (10^4V/W)
C5331	90	100	3	4	0.3	0.6	-	-	6.2	-4.3	-4.5	-4.7
C5331-30	90	100	3	4	0.3	0.6	-	-	6.2	-4.3	-4.5	-4.7
C5331-01	90	100	3	4	0.3	0.6	-	-	10	-7.1	-7.5	-7.9
C5331-31	90	100	3	4	0.3	0.6	-	-	10	-7.1	-7.5	-7.9
C5331-02	90	100	3	4	0.3	0.6	-	-	10	-7.1	-7.5	-7.9
C5331-03	90	100	3	4	0.3	0.6	-	-	9.1	-6.4	-6.75	-7.1
C5331-04	70	80	3	4	0.4	0.8	-	-	3.0	-2.1	-2.3	-2.4
C5331-05	40	50	3	4	0.7	1.4	-	-	1.1	-0.7	-0.75	-0.79
C5331-11	90	100	3	4	-	-	0.5	1.0	3.9	-2.3	-2.46	-2.7
C5331-12	30	40	3	4	-	-	1.3	2.6	2.0	-1.1	-1.26	-1.4
C5331-13	10	20	3	4	-	-	1.7	3.4	1.1	-0.65	-0.69	-0.75

*3: Gain is preset to 30 prior to shipping.

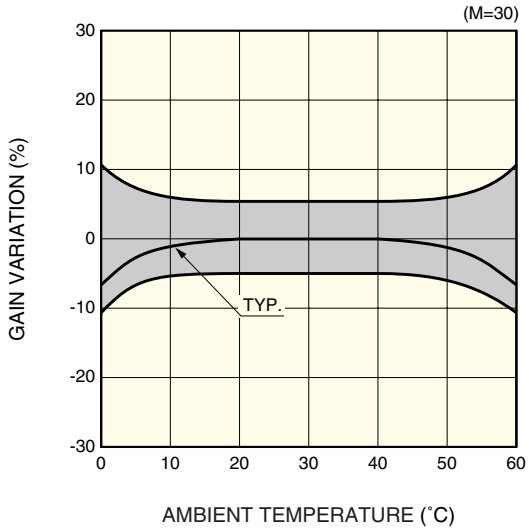
■ Spectral response



* Measured at a reverse voltage giving a gain of 30.
Incident light is 650 nm.

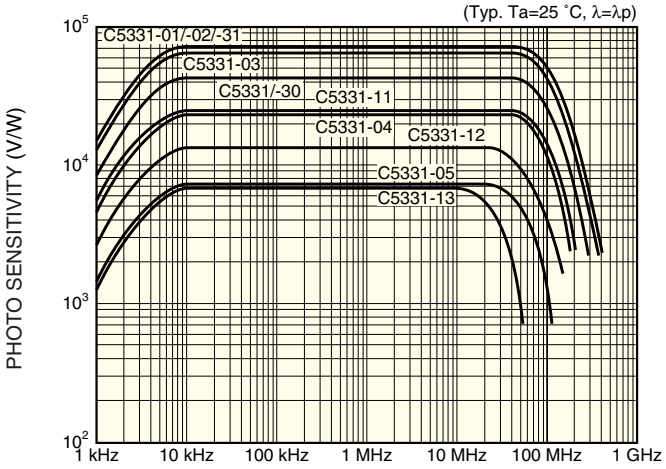
KAPDB0051EA

■ Gain temperature characteristic



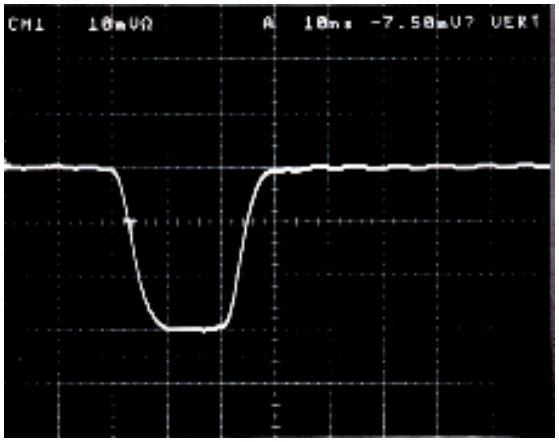
KACCB0020EB

■ Frequency response



KACCB0021EB

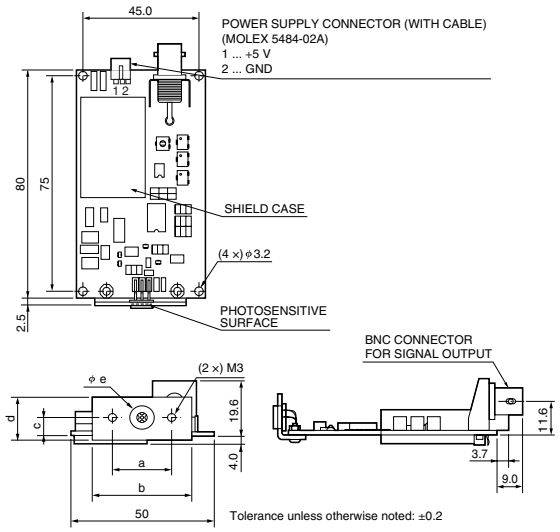
■ Response to stepped light input (C5331-03)



Ta=25 °C, gain M=30, input pulse width=20 µs
X-axis: 10 ns/div., Y-axis: 10 mV/div.

■ Dimensional outlines (unit: mm)

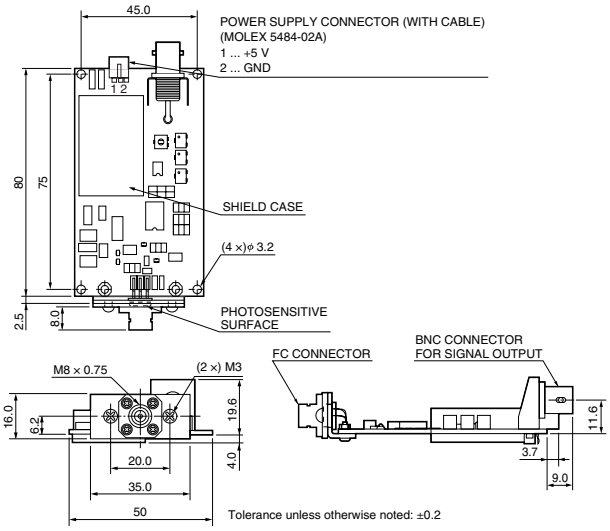
C5331/-01/-02/-03/-04/-05/-11/-12/-13



Type No.	a	b	c	d	e
C5331	20	35	6.2	16	8.2 ± 0.1
C5331-01					4.7 ± 0.1
C5331-02					4.7 ± 0.1
C5331-03					4.7 ± 0.1
C5331-04					8.1 ± 0.1
C5331-05	25	40	8.6	20	12.35 ± 0.1
C5331-11	20	35	6.2	16	4.7 ± 0.1
C5331-12					8.1 ± 0.1
C5331-13	25	40	8.6	20	12.35 ± 0.1

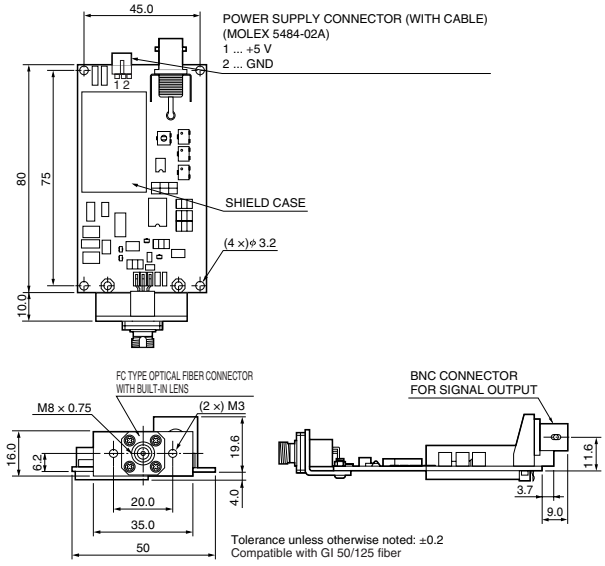
KACCA0013EC

C5331-30



KACCA0093EA

C5331-31



KACCA0094EA

■ Attachment adapters for FC and SMA connectors

APD module	FC adapter	SMA adapter
C5331-01	A8407-18	A8424-18
C5331-02	A8407-18	A8424-18
C5331-03	A8407-18	A8424-18
C5331-04	A8407-05A	A8424-05A
C5331-05	A8407-08	-
C5331-11	A8407-18	A8424-18
C5331-12	A8407-05A	A8424-05A
C5331-13	A8407-08	-
C5460	A8407-05	A8424-05
C5460-01	A8407-05A	A8424-05A

(1) A high voltage power supply is used in this product. Do not remove insulating material potted on the board to prevent possible danger.

(2) Be sure to terminate the output with 50 Ω when using this product.

HAMAMATSU PHOTONICS K.K., Solid State Division
1126-1 Ichino-cho, Hamamatsu City, 435-8558 Japan, Telephone: (81) 053-434-3311, Fax: (81) 053-434-5184, http://www.hamamatsu.com
U.S.A.: Hamamatsu Corporation: 360 Foothill Road, P.O.Box 6910, Bridgewater, N.J. 08807-0910, U.S.A., Telephone: (1) 908-231-0960, Fax: (1) 908-231-1218
Germany: Hamamatsu Photonics Deutschland GmbH: Arzbergerstr. 10, D-82211 Herrsching am Ammersee, Germany, Telephone: (49) 08152-3750, Fax: (49) 08152-2658
France: Hamamatsu Photonics France S.A.R.L.: 8, 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
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
North Europe: Hamamatsu Photonics Norden AB: Smidesvägen 12, SE-171 41 Solna, Sweden, Telephone: (46) 8-509-031-00, Fax: (46) 8-509-031-01
Italy: Hamamatsu Photonics Italia S.R.L.: Strada della Moia, 1/E, 20020 Arese, (Milano), Italy, Telephone: (39) 02-935-81-733, Fax: (39) 02-935-81-741

Cat. No. KACC1007E04
Oct. 2001 DN