

# APD module C4777 series

APD module integrated with peripheral circuits



### Features

- Uses high sensitivity APD  
Two types of APDs with different active areas ( $\phi 0.5$  mm,  $\phi 3.0$  mm) are provided.
- Choice of high sensitivity type and low-light-level detection type  
C4777 detects optical signals from 10 kHz to 100 MHz pulsed light and is suitable for spatial light transmission and rangefinder applications. C4777-01 provides a high photo-electric sensitivity of  $1.25 \times 10^9$  V/W and low NEP of  $2 \text{ fW/Hz}^{1/2}$ , making it excellent for fluorescence measurement and NOx monitors where low-light-level detection is essential.
- Built-in temperature control circuit  
An APD chip, thermoelectric cooler and thermosensor are sealed in the same package along with the temperature control circuit, to keep the APD chip temperature constant and ensure stable measurements.
- Simple operation  
Operates by just connecting to a DC power supply (+5 V,  $\pm 15$  V).

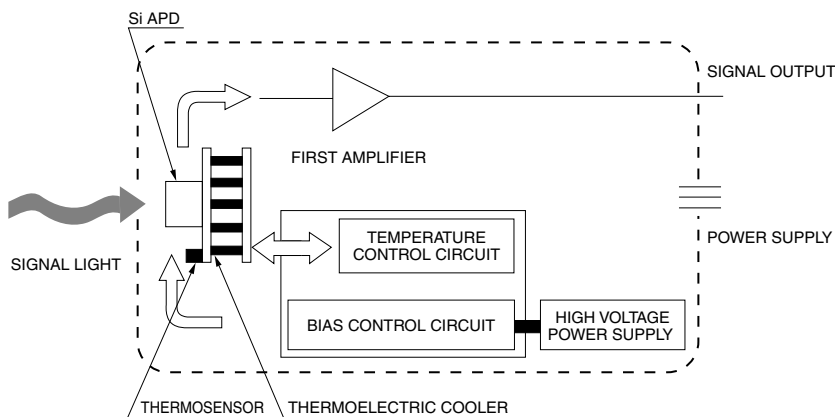
### Applications

- |   |
|---|
| C4777   |
| <ul style="list-style-type: none"> <li>● Spatial light transmission</li> <li>● Optical communication</li> <li>● Rangefinder</li> </ul>  |
| C4777-01  |
| <ul style="list-style-type: none"> <li>● Fluorescence measurement</li> <li>● NOx monitor sensor</li> <li>● Particle counters</li> </ul> |

### ■ Selection guide

Parameter	C4777	C4777-01	Unit
Active area	$\phi 0.5$	$\phi 3.0$	mm
Photo sensitivity	$-2.5 \times 10^5$	$-1.25 \times 10^9$	V/W
Frequency bandwidth	10 k to 100 M	DC to 5 k	Hz

### ■ Block diagram



KACCC0099EA

■ Absolute maximum ratings

Parameter	Symbol	Condition	Value	Unit
Positive supply voltage	-		+7	V
Positive supply voltage	-		+16	V
Negative supply voltage	-		-16	V
Input power	-		10	mW
Operating temperature	Topr		10 to 40	°C
Storage temperature	Tstg		-10 to +60	°C
Operating/storage humidity	-	No condensation	70 % RH below	-

■ Specification (Typ. Ta=25 °C, Vcc=+5 V, +15 V, unless otherwise noted)

● Photoelectric section (APD)

Parameter	Symbol	Condition	C4777	C4777-01	Unit
Active area	A		φ0.5	φ3.0	mm
Peak sensitivity wavelength	λp		800		nm
Spectral response range	λ		400 to 1000		nm
Photo sensitivity	S	λ=800 nm, M=1	0.5		A/W
Gain	M	λ=800 nm	100	50	times
Thermoelectric cooler	-		One-stage	Two-stage	-
Cooling temperature	-		0		°C
Temperature stability of gain	-	Ta=10 to 40 °C	±3		%

● Signal amplification section

C4777

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Cut-off frequency	High band	-3 dB	95	100	-	MHz
	Low band		-	10	15	kHz
Noise equivalent power	NEP	λ=800 nm	-	80	120	fW/Hz <sup>1/2</sup>
Feedback resistance	Rf		-	10	-	kΩ
Photoelectric sensitivity	-	APD include, M=100 λ=800 nm	-2.0	-2.5	-3.0	× 10 <sup>5</sup> V/W
Output impedance	-		-	50	-	Ω
Maximum input light level	-		0.6	0.8	-	μW
Minimum detection limit	-		-	0.8	1.2	nWr.m.s.

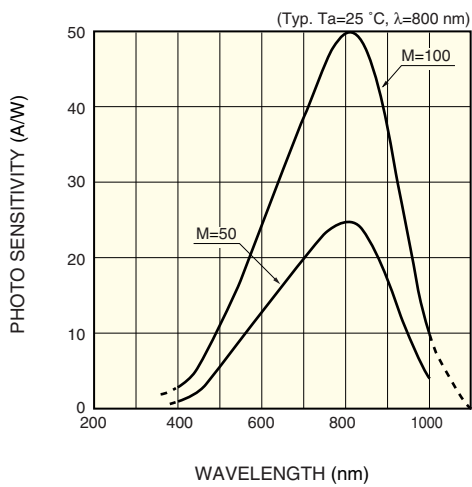
C4777-01

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Cut-off frequency	High band	-3 dB	4	5	-	kHz
	Low band		-	DC	-	-
Noise equivalent power	NEP	λ=800 nm	-	2	4	fW/Hz <sup>1/2</sup>
Feedback resistance	Rf		-	50	-	MΩ
Photoelectric sensitivity	-	APD include, M=50 λ=800 nm	-1.0	-1.25	-1.5	× 10 <sup>9</sup> V/W
Maximum input light level	-		8.8	9.6	-	nW
Minimum detection limit	-		-	0.2	0.4	pWr.m.s.

■ General ratings

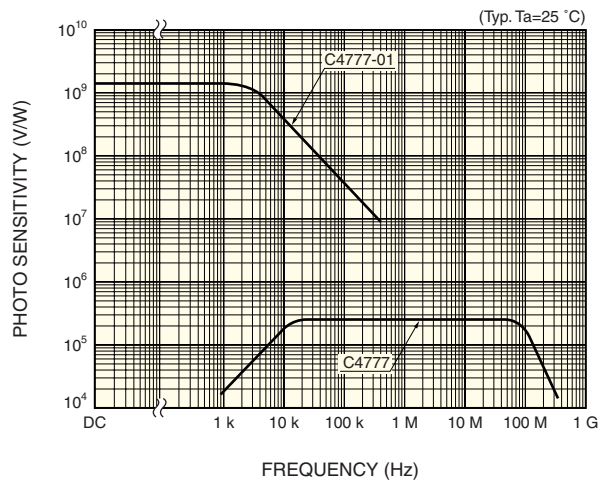
Parameter		Min.	Typ.	Max.	Unit
Power supply	+5 V	+4.4	+5	+5.6	V
	+15 V	+14.4	+15	+15.6	
	-15 V	-14.4	-15	-15.6	
Current consumption	C4777 (+5 V)	-	+1.2	+1.5	A
	C4777 (+15 V)	-	+0.2	+0.3	
	C4777 (-15 V)	-	-0.01	-0.02	
Current consumption	C4777-01 (+5 V)	-	+0.5	+1.0	A
	C4777-01 (+15 V)	-	+0.15	+0.30	
	C4777-01 (-15 V)	-	-0.01	-0.02	
Dimensional outline	C4777	103 × 60 × 40			mm
	C4777-01	106.6 × 60 × 40			
Weight		350			g

■ Spectral response



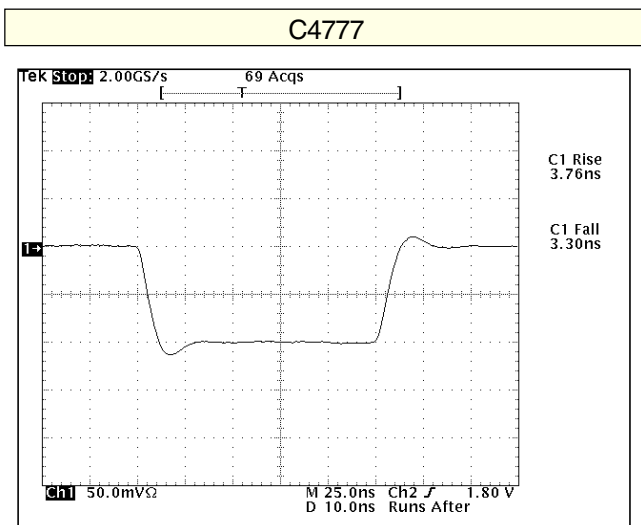
KAPDB0020EB

■ Frequency response



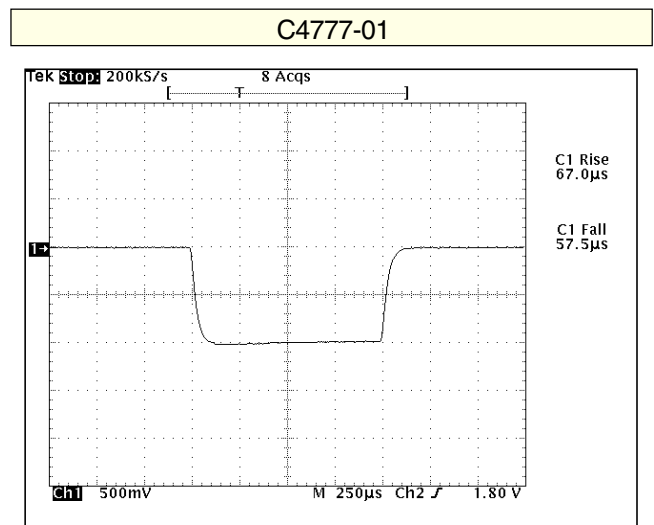
KACCB0048EA

■ Response to stepped light



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

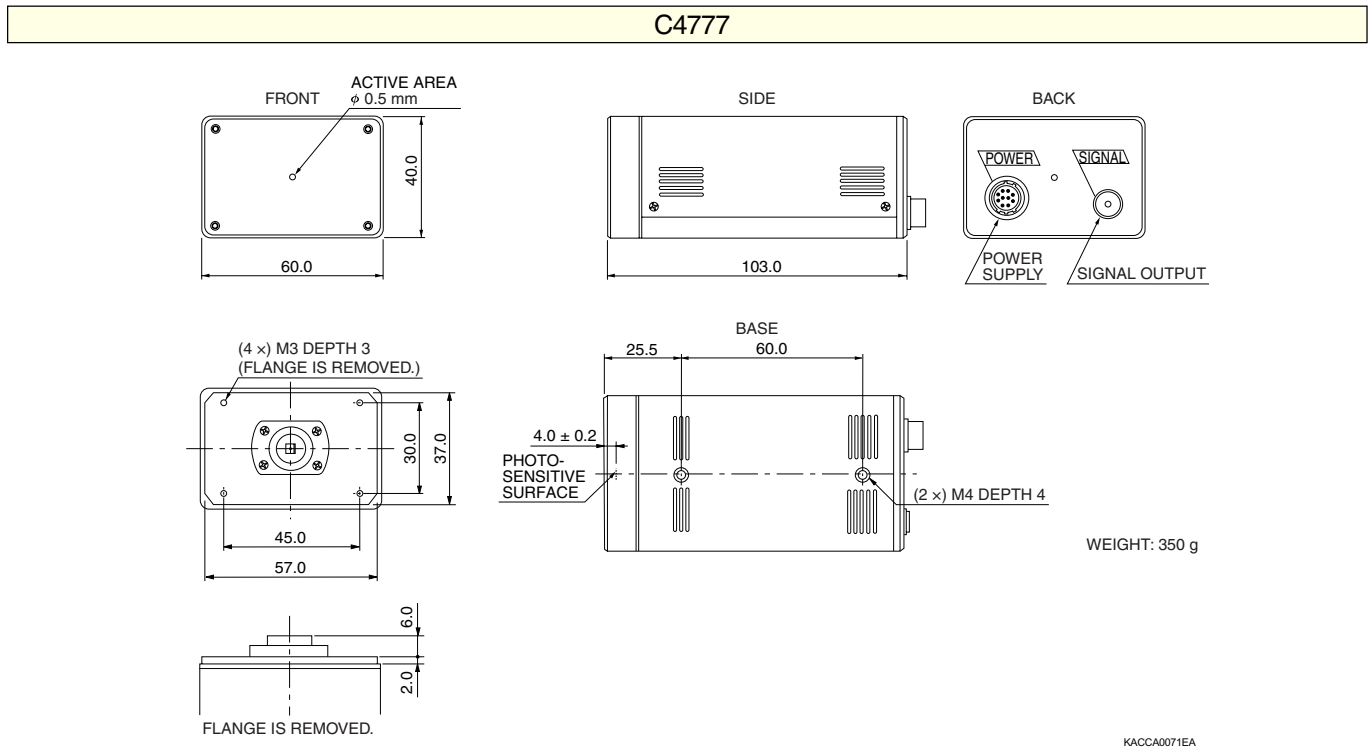
KACCC0130EA



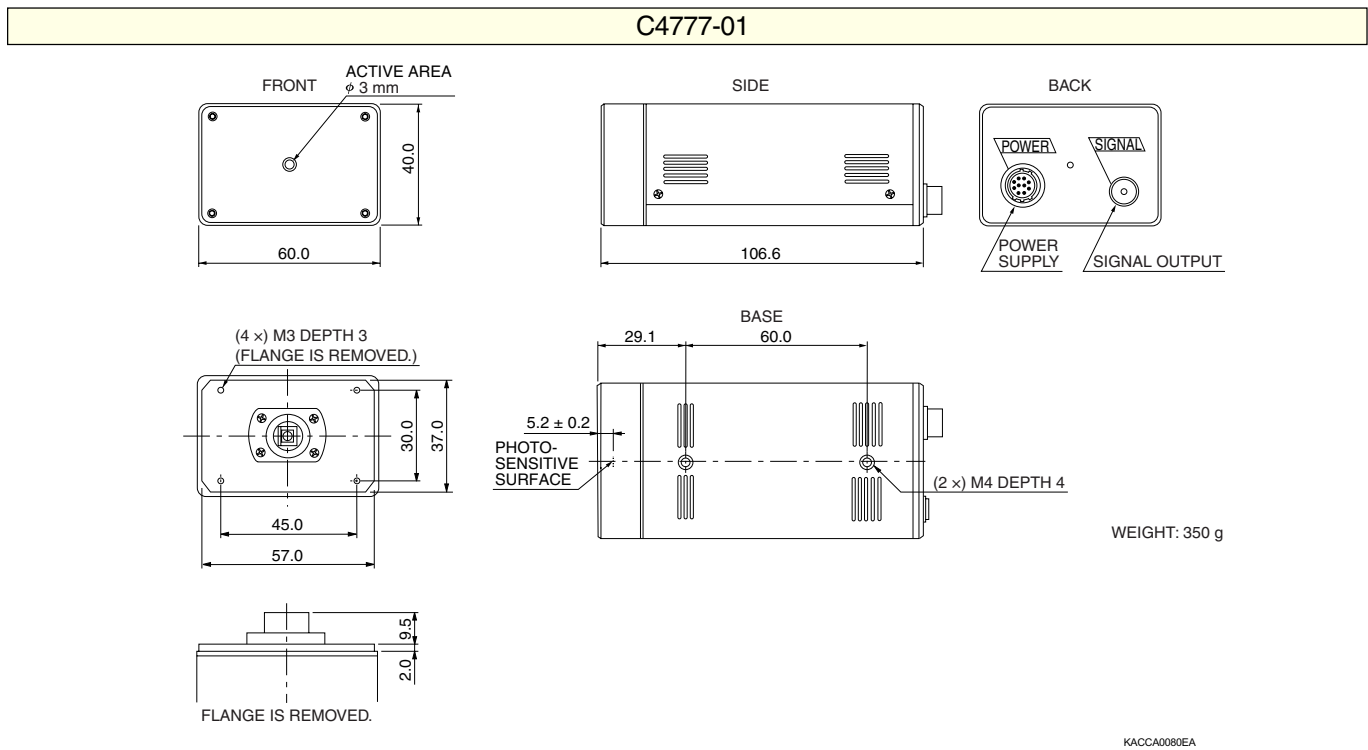
Ta=25 °C, gain M=50, input pulse width=1 ms  
X-axis: 250 µs/div., Y-axis: 500 mV/div.

KACCC0131EA

■ Dimensional outline (unit: mm)



When using C4777, be sure to terminate the output with a 50  $\Omega$  load.



When using C4777-01, do not terminate the output with a 50  $\Omega$  load.

**HAMAMATSU**

Information furnished by HAMAMATSU is believed to be reliable. However, no responsibility is assumed for possible inaccuracies or omissions. Specifications are subject to change without notice. No patent rights are granted to any of the circuits described herein. ©2002 Hamamatsu Photonics K.K.

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