

■ Features

- Ultrafast MIR photodetector with over 20 GHz response
- Response frequency range (-3 dB): DC to 20 GHz
- Peak sensitive wavelength: 4.65 μm
- Photosensitivity: 1 mA/W (Typ.)
- No cooling, and no operation bias are required

■ Applications

- Heterodyne detection
- High frequency/high time resolved measurement



■ Outline

This is a ultrafast mid-infrared photodetector with a response bandwidth of over 20 GHz (-3 dB). It operates bias free with no cooling required, so no external power supplies are needed. Setup happens in two simple steps: connecting the SMA fitting to measuring instruments (oscilloscope etc.), and directing light incidence to the internal focusing lens.

■ General ratings

Parameter	Description	Unit
Connector type	SMA	—
Cooling	Non-cooled	—
Lens	Focusing lens *1	—
Aperture	$\phi 4.5$	mm
Polarizing direction	Marked in the body *2	—

*1 Incident light have to be colimated.

*2 See "Figure 4"

■ Absolute maximum ratings

Parameter	Symbol	Value	Unit
Operating temperature *1	T_{opr}	-10 to +50	$^{\circ}\text{C}$
Storage temperature *1	T_{stg}	-10 to +50	$^{\circ}\text{C}$
Incident light level	P_{max}	1	W/cm^2

*1 No condensation

* No bias is required for the operation.

* Ambient temperature: $T_a=25^{\circ}\text{C}$

■ Electrical and optical characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Peak sensitive wavelength	λ_p	—	4.60	4.65	4.70	μm
Photosensitivity	S	$\lambda=\lambda_p, f_0=1200\text{ Hz}, \Delta f=1\text{ Hz}$	0.5	1.0	—	mA/W
Detectivity	D^*	$\lambda=\lambda_p, f_0=1200\text{ Hz}, \Delta f=1\text{ Hz}$	8.0×10^8	1.5×10^9	—	$\text{cm}\cdot\text{Hz}^{1/2}/\text{W}$
Noise equivalent power	NEP	$\lambda=\lambda_p, f_0=1200\text{ Hz}$	—	3.0×10^{-10}	1.0×10^{-9}	$\text{W}/\text{Hz}^{1/2}$
Cut-off frequency	f_c	-3 dB down, $Z_i=50\ \Omega$	18	20	—	GHz
Terminal capacitance	C_t	$f=1\text{ MHz}$	—	1.1	1.5	pF
Shunt resistance	R_{sh}	$V_{meas}=10\text{ mV}$	70	90	110	k Ω

* Ambient temperature: $T_a=25^{\circ}\text{C}$

Quantum Cascade Photodetector P16309-01

Figure 1: Spectral response (example)

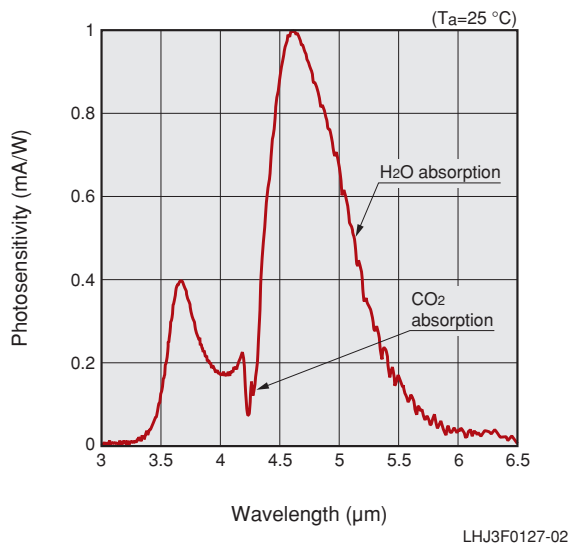


Figure 2: Response frequency (example)

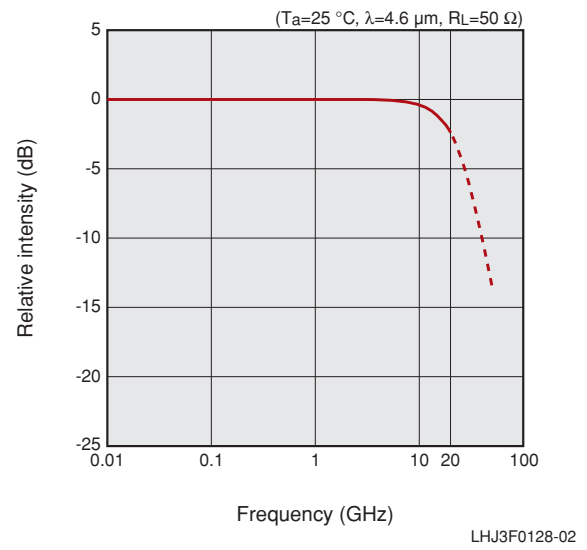
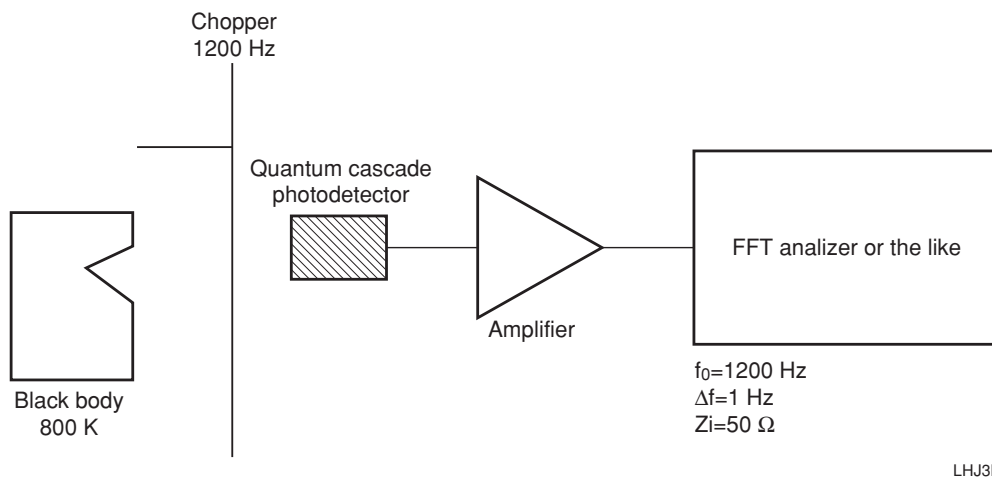
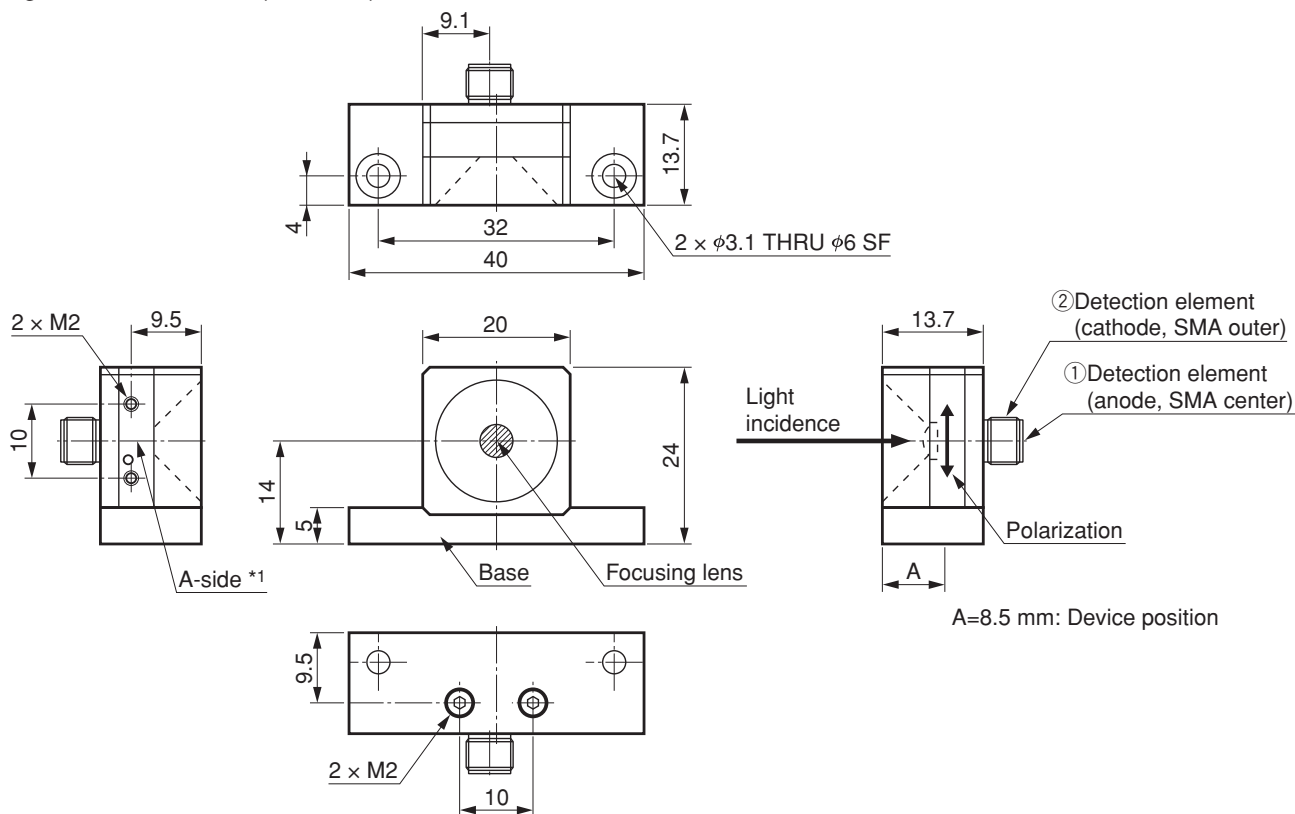


Figure 3: Measurement circuit (example)



Quantum Cascade Photodetector P16309-01

Figure 4: Dimensions (unit: mm)



- *1 A-side can be fixed on the base as the bottom aspect.
- * Tolerances: ± 0.3 mm (dimension without an indication)
- * Both of ① and ② are electrically insulated from the package.

LHJ3F0111-02

● Information described in this material current as of September 2021. Specifications are subject to change without notice.

HAMAMATSU PHOTONICS K.K. www.hamamatsu.com

Laser Promotion Division, Business Promotion G.

1-8-3, Shinmiyakoda, Kita-ku, Hamamatsu City, Shizuoka, 431-2103, Japan, Telephone: (81)53-484-1301, Fax: (81)53-484-1302, E-mail: sales-laser@lpd.hpk.co.jp

U.S.A.: Hamamatsu Corporation: 360 Foothill Road, Bridgewater, NJ 08807, U.S.A., Telephone: (1)908-231-0960, Fax: (1)908-231-1218 E-mail: usa@hamamatsu.com

Germany: Hamamatsu Photonics Deutschland GmbH.: Arzbergerstr. 10, D-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: infos@hamamatsu.fr

United Kingdom: Hamamatsu Photonics UK Limited: 2 Howard Court, 10 Tewin Road, Welwyn Garden City, Hertfordshire AL7 1BW, 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 00, Fax: (46)8-509 031 01 E-mail: info@hamamatsu.se

Italy: Hamamatsu Photonics Italia S.r.l.: Strada della Moia, 1 int. 6, 20044 Arese (Milano), Italy, Telephone: (39)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, Jiaming Center, 27 Dongsanhuan Beilu, Chaoyang District, 100020 Beijing, P.R. China, Telephone: (86)10-6586-6006, Fax: (86)10-6586-2866 E-mail: hpc@hamamatsu.com.cn

Taiwan: Hamamatsu Photonics Taiwan Co., Ltd.: 8F-3, No.158, Section 2, Gongdao 5th Road, East District, Hsinchu, 300, Taiwan R.O.C. Telephone: (886)3-659-0080, Fax: (886)3-659-0081 E-mail: info@hamamatsu.com.tw

Cat. No.LQCD3001E01
SEP. 2021 IP