

■ **Features**

- Ultrafast MIR photodetector with over 20 GHz response
- Response frequency range (-3 dB): DC to 20 GHz
- Peak sensitive wavelength: 4.65  $\mu\text{m}$
- 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 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	$\text{W}/\text{cm}^2$

\*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	$\lambda_p$	—	4.60	4.65	4.70	$\mu\text{m}$
Photosensitivity	S	$\lambda=\lambda_p, f_0=800\text{ Hz}, \Delta f=1\text{ Hz}$	0.5	1.0	—	mA/W
Detectivity	$D^*$	$\lambda=\lambda_p, f_0=800\text{ Hz}, \Delta f=1\text{ Hz}$	$8.0 \times 10^8$	$1.5 \times 10^9$	—	$\text{cm}\cdot\text{Hz}^{1/2}/\text{W}$
Noise equivalent power	NEP	$\lambda=\lambda_p, f_0=800\text{ Hz}$	—	$3.0 \times 10^{-10}$	$1.0 \times 10^{-9}$	$\text{W}/\text{Hz}^{1/2}$
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 $\Omega$

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

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# Quantum Cascade Photodetector P16309-01

Figure 1: Spectral response (example)

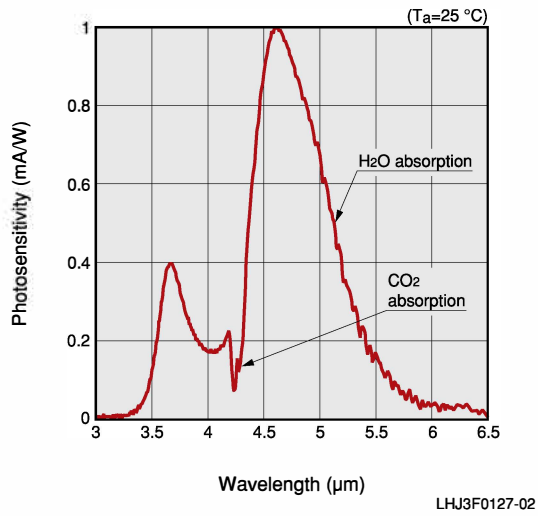


Figure 2: Response frequency (example)

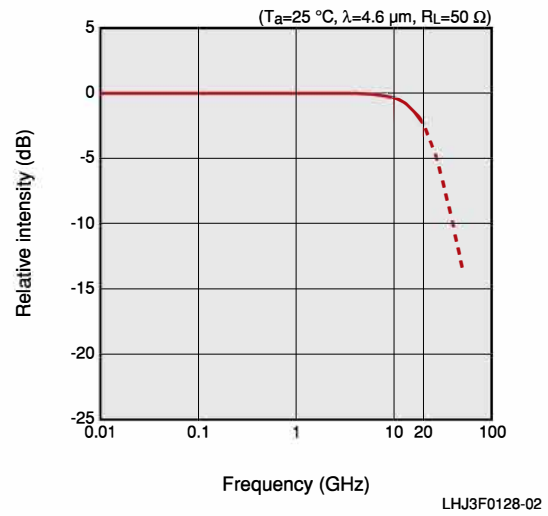
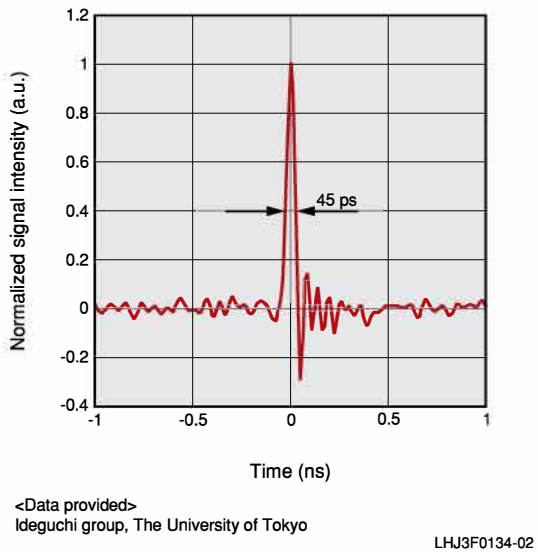
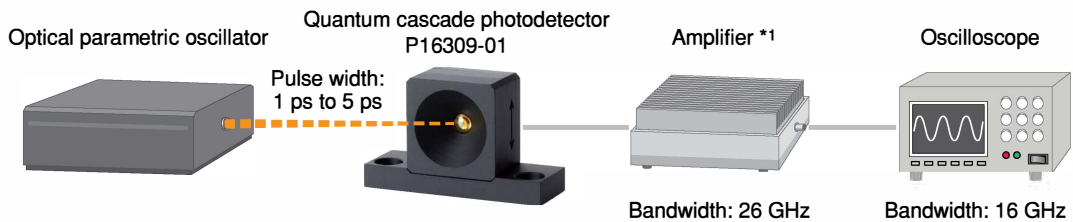


Figure 3: Ultrashort pulse waveform measurement

## ● Measurement example



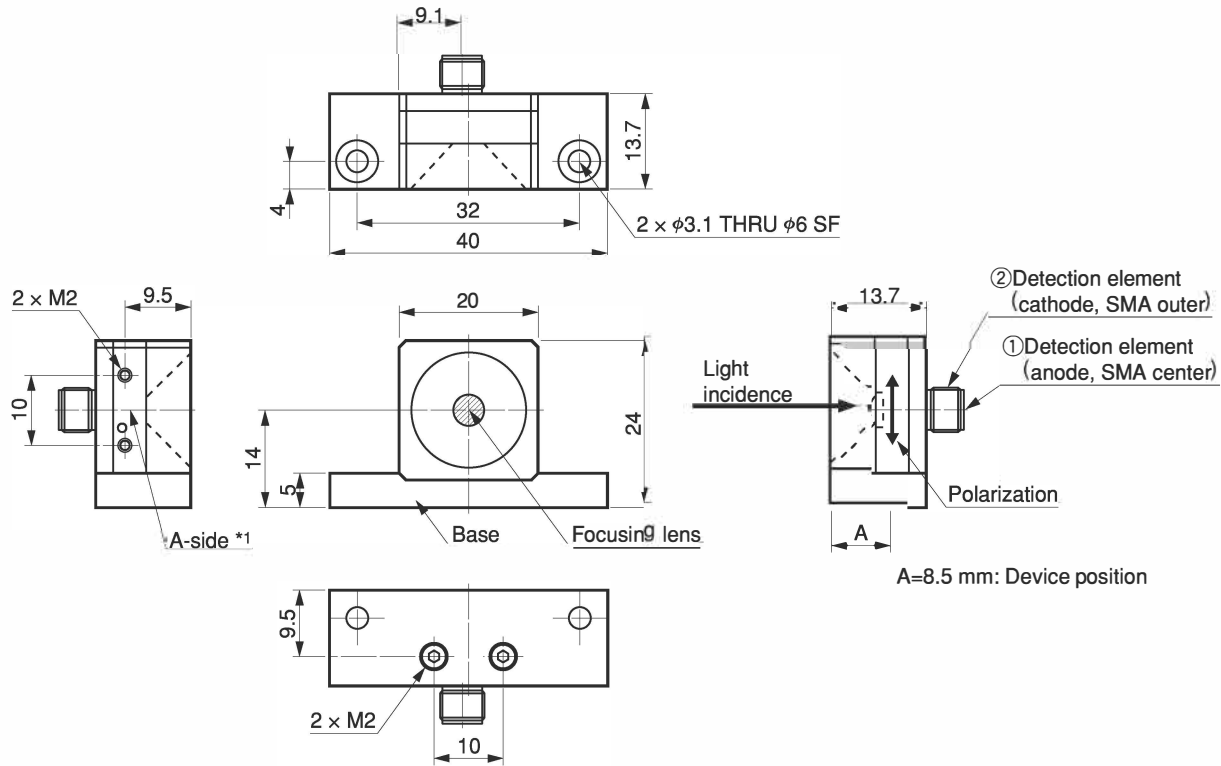
## ● Measurement configuration



\*1 An example: Keysight technologies, 83006A

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Figure 4: Dimensions (unit: mm)



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

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● Information described in this material current as of February 2022. Specifications are subject to change without notice.

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