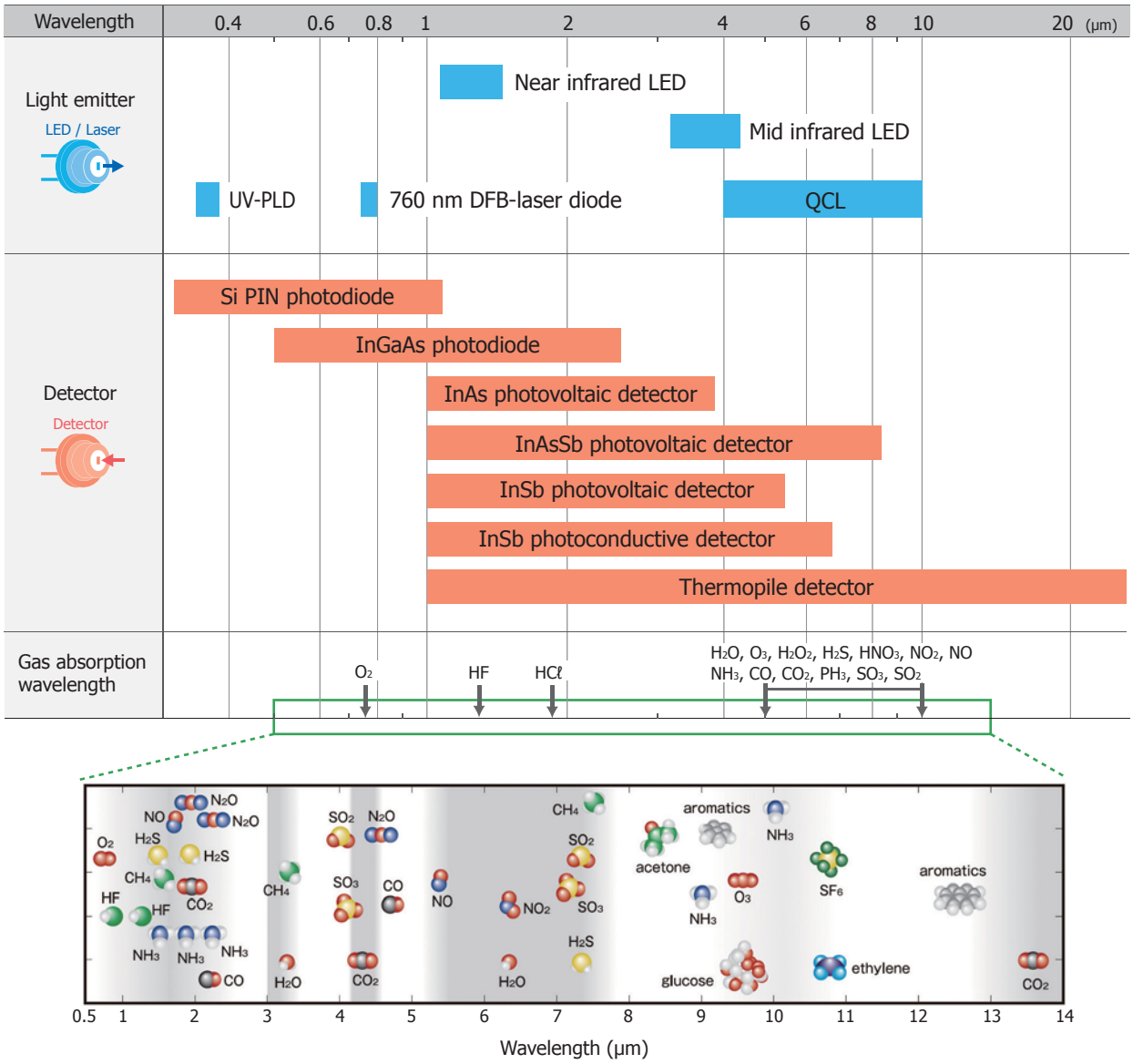
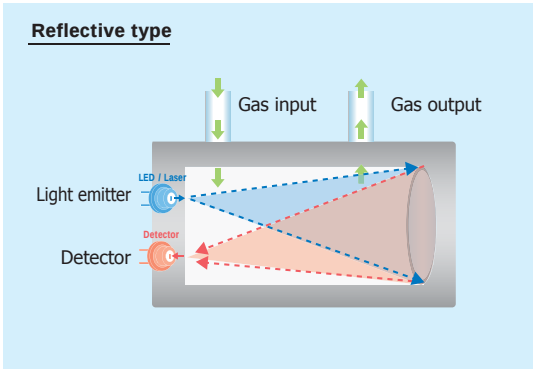
Devices for gas analysis

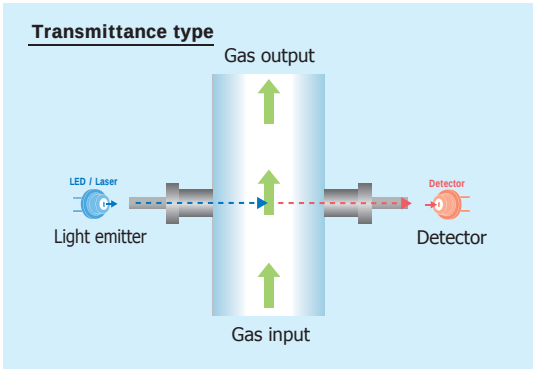
Hamamatsu provides light emitters and detectors for various gas analyses.

Lineup of light emitters and detectors



Images of light emitter and detector combinations





Light emitters

Quantum cascade lasers (QCL)

Laser
4 to 10 µm

■ Features

- Semiconductor laser with a oscillation wavelength of 4 to 10 µm
- Light source optimal for molecular gas analysis
- Compact and portable

< DFB-CW drive type QCL >

Type no.	Wavelength *	Wave number	Target gas
L12004-2310H-C	4.33 µm	2310 cm^{-1}	CO_2, CO_2 isotope
L12004-2209H-C	4.53 µm	2209 cm^{-1}	N_2O
L12004-2190H-C	4.57 µm	2190 cm^{-1}	N_2O, CO
L12005-1900H-C	5.26 µm	1900 cm^{-1}	NO
L12006-1631H-C	6.13 µm	1631 cm^{-1}	NO_2
L12007-1392H-C	7.18 µm	1392 cm^{-1}	SO_3
L12007-1354H-C	7.39 µm	1354 cm^{-1}	SO_2
L12007-1294H-C	7.73 µm	1294 cm^{-1}	$^{12}CH_4$ / $^{13}CH_4$

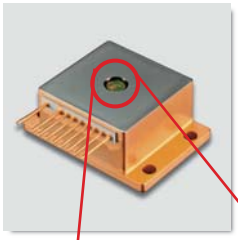
* 8.91 µm, 9.06 µm and 9.67 µm types are currently in development.

< DFB-pulse drive type QCL >

Type no.	Wavelength	Wave number	Target gas
L12014-2231T-C	4.48 µm	2231 cm^{-1}	N_2O, CO, CO_2
L12015-1901T-C	5.26 µm	1901 cm^{-1}	NO
L12016-1630T-C	6.13 µm	1630 cm^{-1}	NO_2
L12017-1278T-C	7.82 µm	1278 cm^{-1}	CH_4, N_2O
L12020-0993T-C	10.07 µm	993 cm^{-1}	NH_3

Under development
CW Quantum cascade laser (Built-in lens)

Laser
4 µm



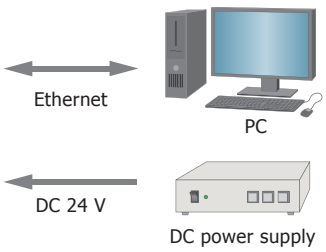
■ Features

- Allows to use under good usability without beam alignment
- Emission wavelength: 4 µm range
- Aspheric collimating lens integrated
- Low reflectance output window (ZnSe)

Note: Please contact a Hamamatsu sales office for the availability of the other wavelength above.

Under development
Plug and play pulsed QCL module

Laser
4 to 10 µm



■ Features

- Pulsed DFB-QCL (TO-8) included
- Integrated pulse driver circuit and TEC controller
- Optional collimating lens available
- Uses DC 24 V input
- Ethernet connection for software control
- Connect up to 4 units in parallel

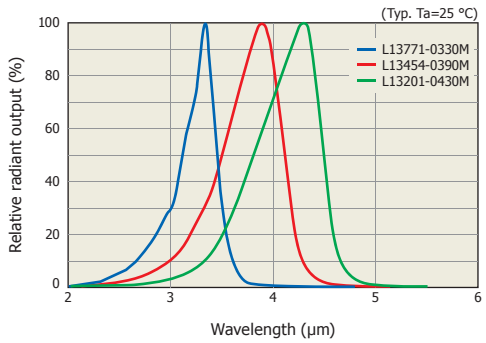
NEW
Mid infrared LED

LED
3.3/3.9/4.3 µm

■ Features

- High output power
  L13771-0330M (3.3 µm): 0.25 mW
  L13454-0390M (3.9 µm): 0.15 mW
  L13201-0430M (4.3 µm): 0.1 mW
- High-speed response
- High stability
- Low power consumption

■ Emission spectrum



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760 nm DFB laser diodes

Laser
760 nm

Fiber output laser diode
L13421-01

CW laser diode
L13421-04

■ Features

- Emission wavelength: 760.6 nm
  (Wavelength range of peak absorption line of oxygen)
- High power type for oxygen analysis and monitoring
- Wavelength tuning by forward current and operating temperature (LD)
- Accurate temperature control by builti-in TEC module (L13421-01)

Note: Please contact a Hamamatsu sales office for the particular wavelength requirement (759 nm to 763 nm)

Under development

Pulsed laser diode (UV-PLD)

Laser
335 to 360 nm

■ Features

- Flexible in wavelength
  (λ=355 nm to 360 nm)
- Compact, light weight and rugged package
- To replace conventional gas or solid state lasers

■ Electrical and optical characteristics [$T_{op(Id)}$=25 °C]

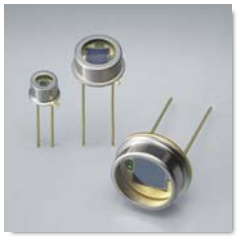
Type no.	Symbol	Condition	Min.	Typ.	Max.	Unit
Radiant peak output power	ϕ_{ep}	I_{fp}=1 A	10	20	-	mW
Forward voltage	V_f		-	-	50	V
Peak emission wavelength	λp		335	-	360	nm
Lasing threshold current	I_{th}	-	-	0.6	-	A

Geneal operating condition: Pulse width (tw)=20 ns, Repetition frequency (fr)=5 kHz

NEW

Si photodiode

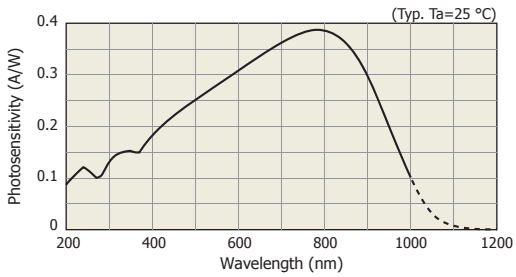
Detector
190 to 1000 nm



■ Features

- With UV glass window (hermetically sealed)
- High sensitivity in UV region
- High reliability for monitoring UV light irradiation
- Resin material not used

■ Spectral response



Type no. : S12698 series

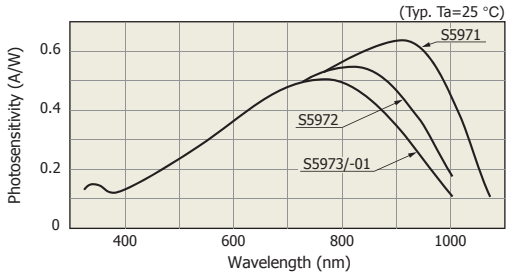
Si PIN photodiode

Detector
300 to 1100 nm

■ Features

- Excellent linearity
- Low noise
- Various photosensitive area sizes and packages are available.

■ Spectral response

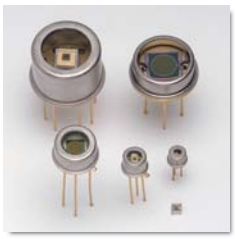


Type no. : S5971, S5972, S5821, etc.

Detectors

InGaAs PIN photodiodes

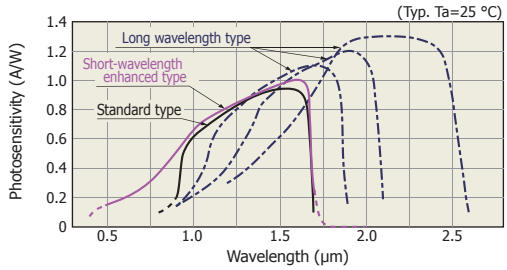
Detector
0.5 to 2.6 µm



■ Features

- High speed, high sensitivity, and low dark current
- Various photosensitive area sizes and packages are available.
- Short-wavelength enhanced type with sensitivity from 0.5 µm and long wavelength type with sensitivity to the near infrared region are available.

■ Spectral response



Type no.: <Non-cooled type> G1218X series, G10899 series
<Cooled type> G1218X series, etc.

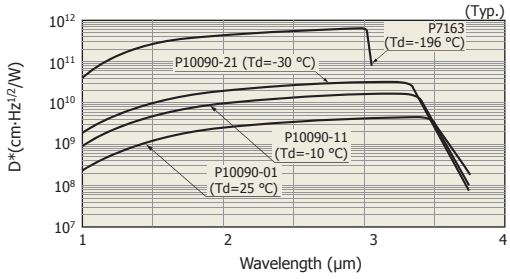
InAs photovoltaic detectors

Detector
1 to 3.8 µm

■ Features

- Low noise and high detectivity
- High reliability
- Available in multi-element arrays (custom product)
- Metal dewar type is also available.

■ Spectral response

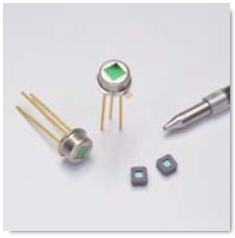


Type no.: P10090 series, etc.

NEW

InAsSb photovoltaic detectors
(Non-cooled type, 5 µm band max.)

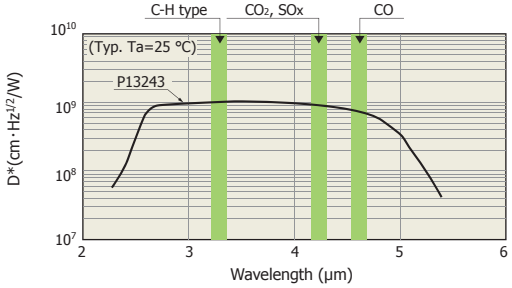
Detector
2.5 to 5.3 µm



■ Features

- High sensitivity
- Non-cooled type
- Small package
- RoHS comliance

■ Spectral response



Type no.: P13243 series

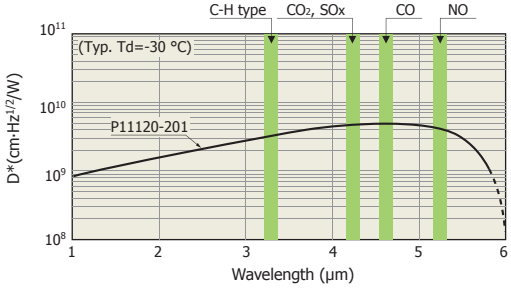
InAsSb photovoltaic detectors
(TE-cooled type, 5 µm band max.)

Detector
1 to 5.8 µm

■ Features

- High-speed response and high sensitivity, thermoelectrically cooled infrared detectors with no liquid nitrogen required
- Crystal growth technology originally developed by Hamamatsu is utilized.
- Applicable to CO_2, SOx, and NOx, etc.
- Metal dewar type is also available.

■ Spectral response



Type no.: P11120-201

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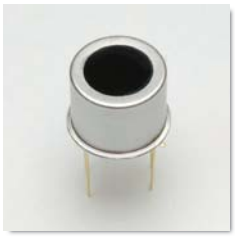
InAsSb photovoltaic detectors
(TE-cooled type, 8 µm band max.)

Detector
3.5 to 8.3 µm



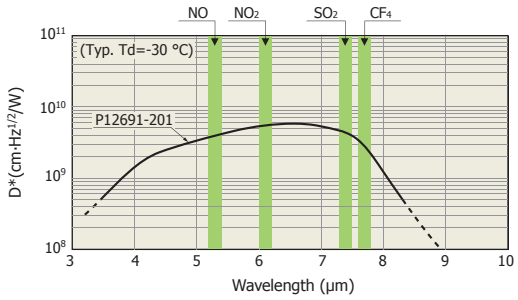
■ Features

· High-speed response and high sensitivity, thermoelectrically cooled infrared detectors with no liquid nitrogen required

· Crystal growth technology originally developed by Hamamatsu is utilized.

· Applicable to NO, NO_2, SO_2, H_2S.

■ Spectral response



Type no.: P12691-201

InSb photoconductive detectors

Detector
1 to 6.7 µm

■ Features

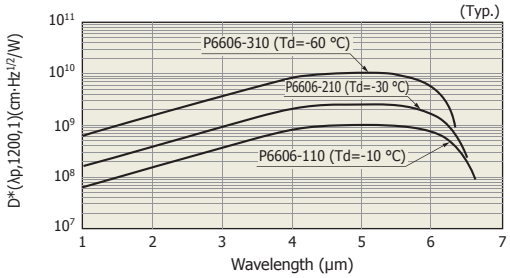
· Measurement for long periods is possible.

· TE-cooled type ensures high speed and high sensitivity detection of up to approximately 6.7 µm.

· Metal dewar type is available. (InSb photovoltaic detector)

· Module type with preamp is also available.

■ Spectral response



Type no.: P6606 series, etc.

InSb photovoltaic detectors
(Metal dewar type)

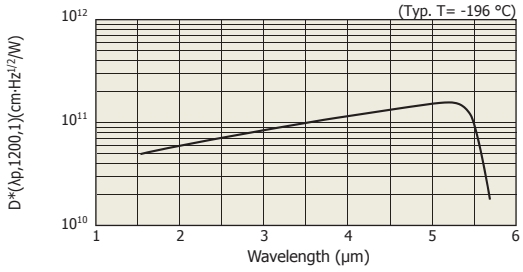
Detector
1 to 5.5 µm

■ Features

· Suitable for CO_2 and SOx (SO, SO_2, SO_3) gas analysis due to high sensitivity in 3 to 5 µm band

· Built-in preamp type available
Built-in preamp allows high precision photometry.
P7751-01 (Uses P5968-060.)
P7751-02 (Uses P5968-200.)

■ Spectral response



Type no.: P5968/P4247 series

Thermopile detectors

Detector
1 to 25 µm

■ Features (dual element type)

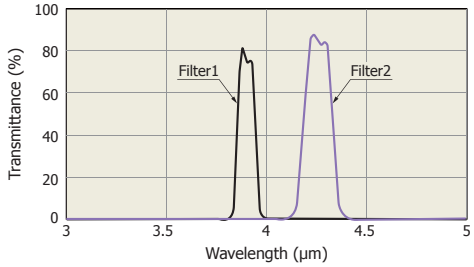
· For CO_2 concentration measurement

· Two wavelengths can be detected by one element.
(Reference light: 3.9 µm, CO_2: 4.3 µm)

· TO-5 package

· Single element type is also available.
(High sensitivity in 3 to 5 µm band)

■ Transmittance characteristics of band-pass filter (dual element type)



Type no.: <Dual element type> T11722-01 <Single element type> T11262-01

Detectors (Module products)

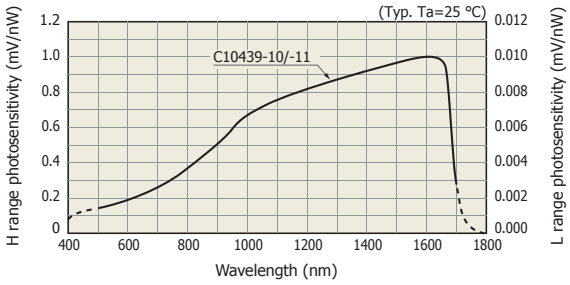
Photodiode modules
(Non-cooled InGaAs PIN photodiode)

Detector
0.5 to 1.7 µm

■ Features

- Voltage output for easy handling
- Two-range (High/Low) switching function
- Only half size of a business card
- Can be mounted on optical bench rod (M4)

■ Spectral response



Type no.: C10439-10/-11
(The modules that integrated Si photodiode are also available.)

Photodiode modules
(Non-cooled InAsSb photovoltaic detector)

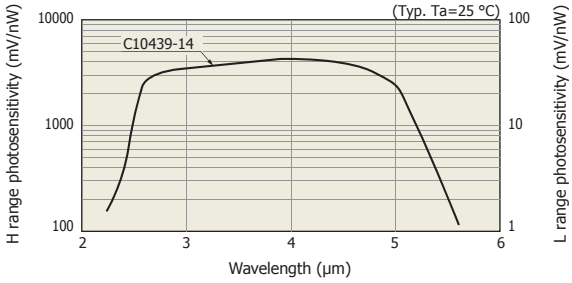
Under development

Detector
2.5 to 5.3 µm

■ Features

- Voltage output for easy handling
- Two-range (High/Low) switching function
- Only half size of a business card
- Can be mounted on optical bench rod (M4)

■ Spectral response



Type no.: C10439-14

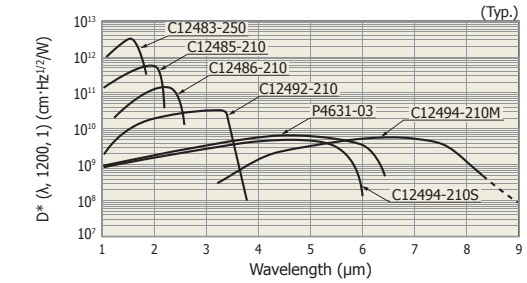
Infrared detector modules with preamp (TE-cooled type)

Detector
1 to 8.3 µm

■ Features

- High S/N
- Compact size
- Easy to use
  Operates just by connecting to DC power supply
- Circuit design optimized for detector characteristics
- Built-in thermoelectric cooling control circuit (fixed control temperature)

■ Spectral response



Type no.: C12483-250, C12485-210, C12486-210, C12492-210, C12494-210S/-210M, P4631-03

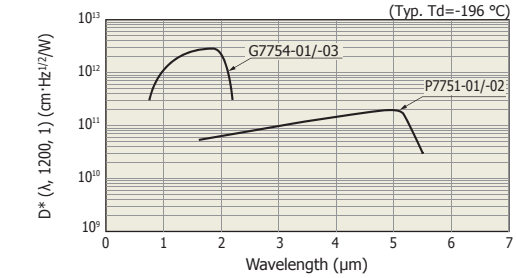
Infrared detector modules with preamp (Metal dewar type)

Detector
0.9 to 5.5 µm

■ Features

- Compact integral detector unit
- Optimum connections between the detector element and preamplifier allow amplified signals to be easily obtained.

■ Spectral response



Type no.: G7754-01/-03, P7751-01/-02

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