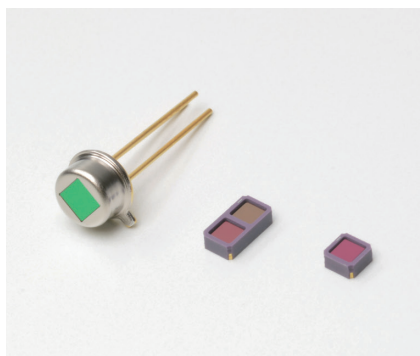


InAsSb photovoltaic detectors

[With band-pass filter] | P16112/P16612/P16849 series



Back-illuminated type infrared detectors with band-pass filter (3.3 μm, 3.9 μm, 4.26 μm, 4.45 μm)

These are InAsSb photovoltaic detectors that use a band-pass filter for the window material. By using a back-illuminated structure, we greatly improved the sensitivity temperature coefficient compared to the front-illuminated type. Types using a band-pass filter with a center wavelength of 3.3 μm, 3.9 μm, or 4.26 μm are suitable for gas measurement, and a type using a band-pass filter of 4.45 μm is suitable for flame monitoring. These are environmentally friendly infrared detectors and do not use lead, mercury, or cadmium, which are substances restricted by the RoHS directive. A two-element type that can detect two wavelength is also available.

Features

- High sensitivity
- High-speed response
- High shunt resistance
- Compact, surface mount ceramic package
- Compatible with lead-free solder reflow (ceramic package)

Applications

- Gas measurement (CH₄, CO₂)
- Flame monitors (CO₂ resonance radiation)

Option (sold separately)

- Amplifier for infrared detector **C4159-01**

Structure

Type no.	Number of elements	Photosensitive area (mm)	Window material*1	Package	Cooling	Field of view FOV (degrees)				
P16112-033MF	1	0.7 × 0.7	BPF (3.3 μm)	TO-46	Non-cooled	87				
P16112-039MF			BPF (3.9 μm)							
P16112-043MF			BPF (4.26 μm)							
P16112-045MF			BPF (4.45 μm)							
P16612-033CF	1		0.7 × 0.7	BPF (3.3 μm)		Ceramic	Non-cooled	86		
P16612-039CF				BPF (3.9 μm)						
P16612-043CF				BPF (4.26 μm)						
P16612-045CF				BPF (4.45 μm)						
P16849-011CF	2	0.7 × 0.7		BPF (3.3 μm)	Ceramic				Non-cooled	86
P16849-012CF				BPF (3.9 μm)						
				BPF (4.26 μm)						

*1: BPF: Band-pass filter. For windowless and AR coating types, refer to the P16612-011CN datasheet.

➤ Absolute maximum ratings (Typ. Ta=25 °C, unless otherwise noted)

Type no.	Reverse voltage V _R (V)	Operating temperature* ² T _{opr} (°C)	Storage temperature* ² T _{stg} (°C)	Incident light level (W/mm ²)	Soldering temperature T _{sol} (°C)
P16112-033MF	1	-40 to +85	-40 to +85	1	-
P16112-039MF					
P16112-043MF					
P16112-045MF					
P16612-033CF					
P16612-039CF					
P16612-043CF					
P16612-045CF					
P16849-011CF					
P16849-012CF					
					240 (once)* ³

*2: No dew condensation

When there is a temperature difference between a product and the surrounding area in high humidity environments, dew condensation may occur on the product surface. Dew condensation may cause deterioration in characteristics and reliability.

*3: Reflow soldering, JEDEC J-STD-020 MSL 2, see P.8

Note: Exceeding the absolute maximum ratings even momentarily may cause a drop in product quality. Always be sure to use the product within the absolute maximum ratings.

➤ Electrical and optical characteristics (Typ. Ta=25 °C, unless otherwise noted)

Type no.	Center wavelength CWL			Spectral response half width FWHM		Photosensitivity S* ⁴ λ=CWL (mA/W)	Shunt resistance R _{sh} V _R =10 mV (kΩ)	Detectivity D* (CWL, 1200, 1)		Noise equivalent power NEP λ=λ _p		Rise time t _r * ⁵ (ns)	Terminal capacitance C _t * ⁶ (pF)
	Min. (nm)	Typ. (nm)	Max. (nm)	Typ. (nm)	Max. (nm)			Min. (cm ² ·Hz ^{1/2} /W)	Typ. (cm ² ·Hz ^{1/2} /W)	Typ. (W/Hz ^{1/2})	Max. (W/Hz ^{1/2})		
P16112-033MF	3270	3300	3330	160	180	2.8	180	3.2 × 10 ⁸	6.5 × 10 ⁸	1.1 × 10 ⁻¹⁰	2.2 × 10 ⁻¹⁰	15	0.5
P16112-039MF	3820	3900	3980	90	110	3.2		3.7 × 10 ⁸	7.4 × 10 ⁸	9.5 × 10 ⁻¹¹	1.9 × 10 ⁻¹⁰		
P16112-043MF	4217	4260	4303	140	160	3.2		3.7 × 10 ⁸	7.4 × 10 ⁸	9.5 × 10 ⁻¹¹	1.9 × 10 ⁻¹⁰		
P16112-045MF	4400	4450	4500	350	400	3.7		4.3 × 10 ⁸	8.6 × 10 ⁸	8.2 × 10 ⁻¹¹	1.6 × 10 ⁻¹⁰		
P16612-033CF	3270	3300	3330	160	180	2.8		3.2 × 10 ⁸	6.5 × 10 ⁸	1.1 × 10 ⁻¹⁰	2.2 × 10 ⁻¹⁰		
P16612-039CF	3820	3900	3980	90	110	3.2		3.7 × 10 ⁸	7.4 × 10 ⁸	9.5 × 10 ⁻¹¹	1.9 × 10 ⁻¹⁰		
P16612-043CF	4217	4260	4303	140	160	3.2		3.7 × 10 ⁸	7.4 × 10 ⁸	9.5 × 10 ⁻¹¹	1.9 × 10 ⁻¹⁰		
P16612-045CF	4400	4450	4500	350	400	3.7		4.3 × 10 ⁸	8.6 × 10 ⁸	8.2 × 10 ⁻¹¹	1.6 × 10 ⁻¹⁰		
P16849-011CF	3270	3300	3330	160	180	2.8		3.2 × 10 ⁸	6.5 × 10 ⁸	1.1 × 10 ⁻¹⁰	2.2 × 10 ⁻¹⁰		
	3820	3900	3980	90	110	3.2		3.7 × 10 ⁸	7.4 × 10 ⁸	9.5 × 10 ⁻¹¹	1.9 × 10 ⁻¹⁰		
P16849-012CF	4217	4260	4303	140	160	3.2		3.7 × 10 ⁸	7.4 × 10 ⁸	9.5 × 10 ⁻¹¹	1.9 × 10 ⁻¹⁰		
	3820	3900	3980	90	110	3.2		3.7 × 10 ⁸	7.4 × 10 ⁸	9.5 × 10 ⁻¹¹	1.9 × 10 ⁻¹⁰		

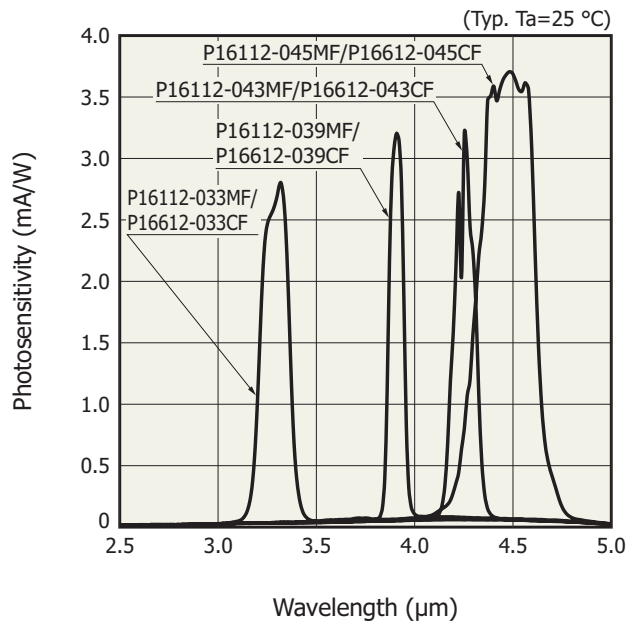
*4: Uniform irradiation on the entire photosensitive area

*5: V_R=0 V, R_L=50 Ω, 10 to 90%

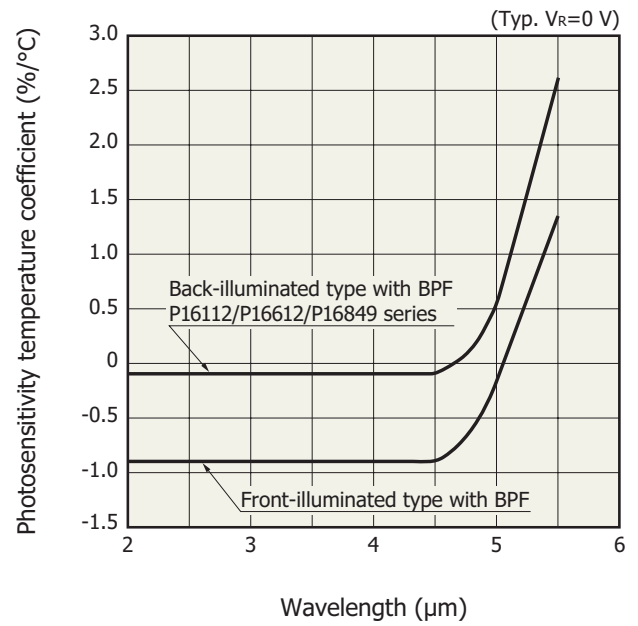
*6: V_R=0 V, f=1 MHz

Note: Uniform irradiation must be applied to the entire photosensitive area during use.

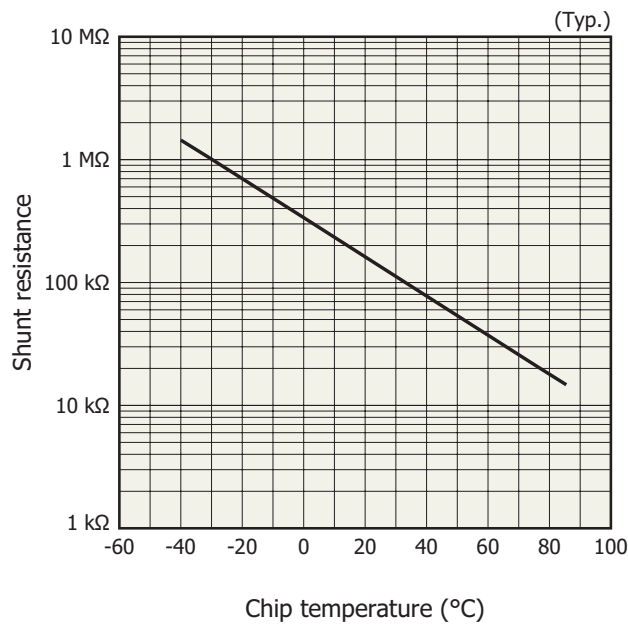
Spectral response



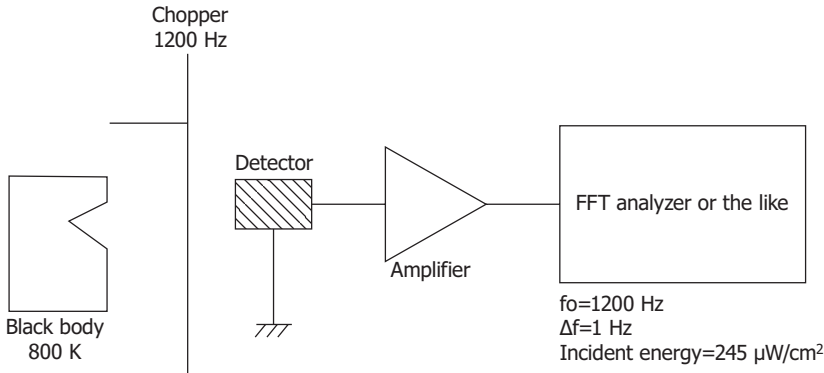
Photosensitivity temperature characteristics



Shunt resistance vs. chip temperature



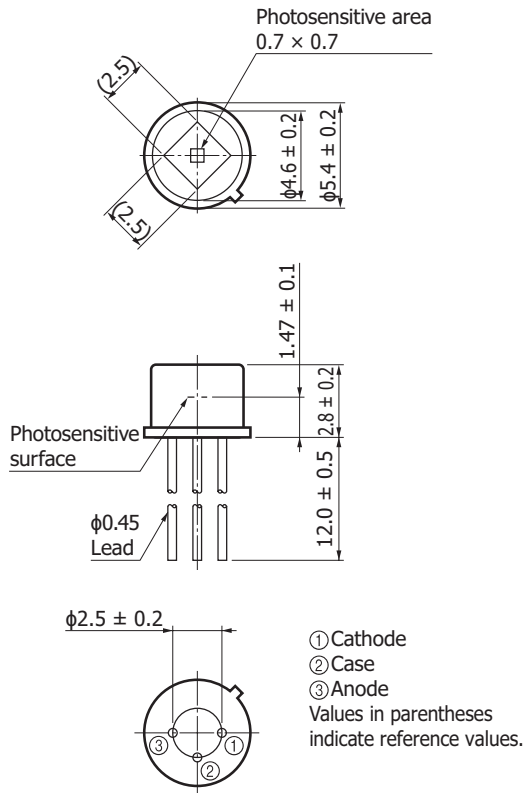
Measurement circuit example



KIRDC0127EA

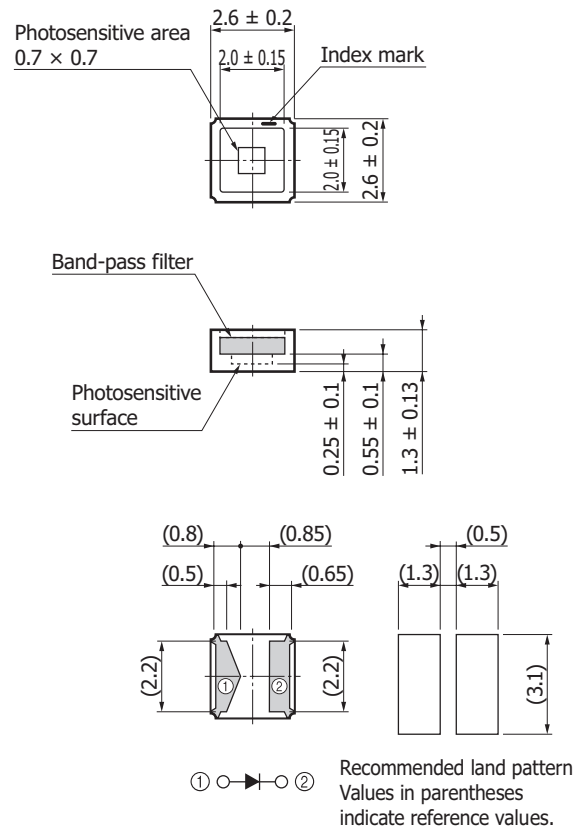
Dimensional outlines (unit: mm)

P16112-033MF/-039MF/-043MF/-045MF



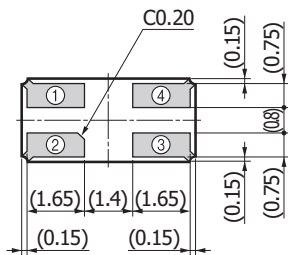
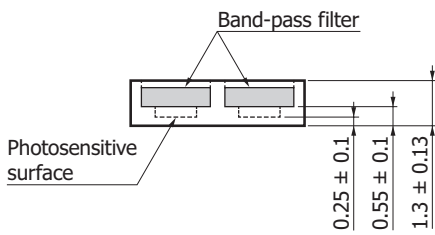
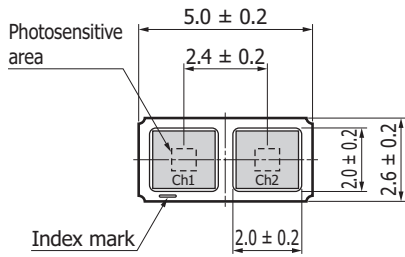
KIRDA0284EA

P16612-033CF/-039CF/-043CF/-045CF

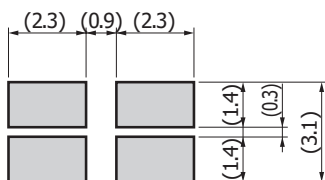


KIRDA0288EA

P16849-011CF/-012CF



- ① Cathode (Ch1)
 - ② Anode (Ch1)
 - ③ Anode (Ch2)
 - ④ Cathode (Ch2)
- Values in parentheses are not guaranteed, but for reference.



Recommended land pattern

Type no.	Ch1	Ch2
P16849-011CF	3.3 μm	3.9 μm
P16849-012CF	4.26 μm	3.9 μm

KIRDA0287EA

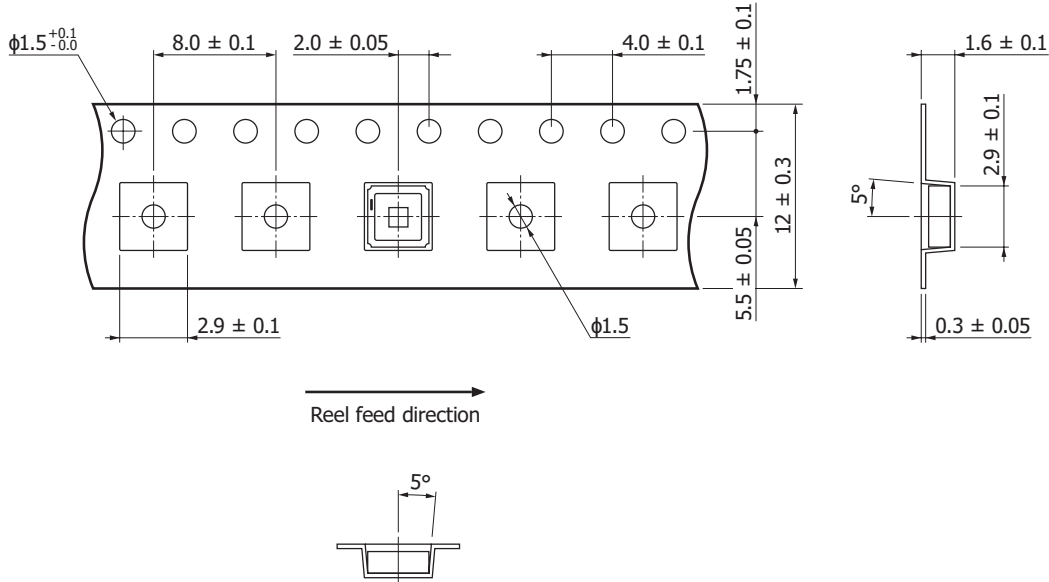
Standard packing specifications

P16612-033CF/-039CF/-043CF/-045CF

■ Reel (conforms to JEITA ET-7200)

Outer diameter	Hub diameter	Tape width	Material	Electrostatic characteristics
φ180 mm	φ60 mm	12 mm	PS	Conductive

■ Embossed tape (unit: mm, material: PS, conductive)



KLED0143EA

■ Packing quantity

500 pcs/reel

■ Packing state

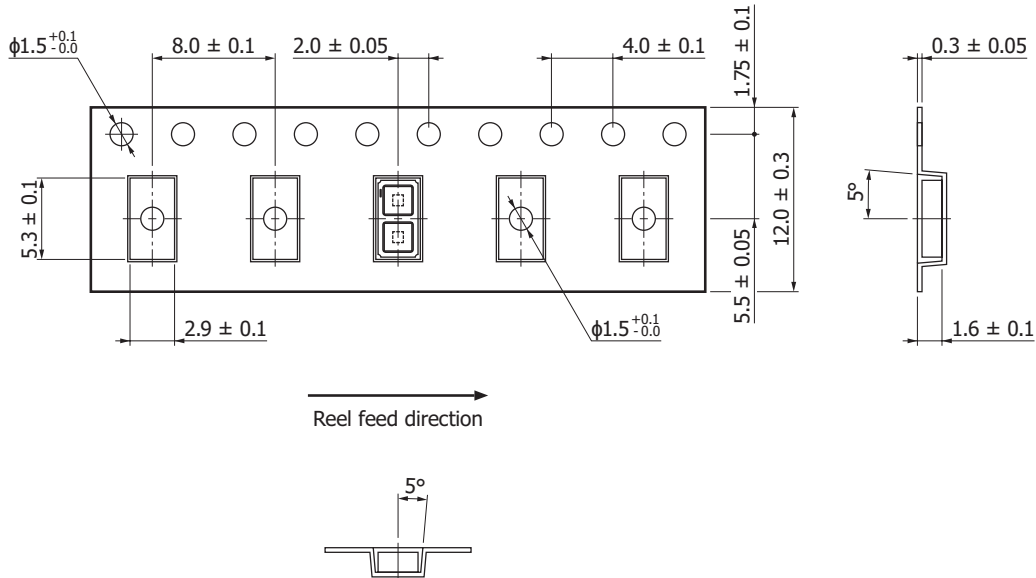
Reel and desiccant in moisture-proof packaging (vacuum-sealed)

P16849-011CF/-012CF

■ Reel (conforms to JEITA ET-7200)

Outer diameter	Hub diameter	Tape width	Material	Electrostatic characteristics
φ180 mm	φ60 mm	12 mm	PS	Conductive

■ Embossed tape (unit: mm, material: PS, conductive)



K1RDC0146EA

■ Packing quantity

100 pcs/reel

■ Packing state

Reel and desiccant in moisture-proof packaging (vacuum-sealed)

Recommended soldering conditions

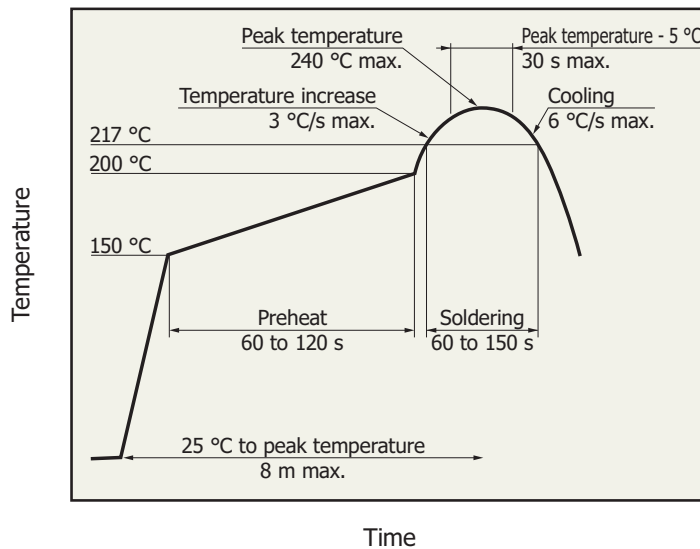
P16112-033MF/-039MF/-043MF/-045MF

· Solder temperature: 260 °C (10 s or less, once)

Solder the leads at a point at least 1 mm away from the package body.

Note: When you set soldering conditions, check that problems do not occur in the product by testing out the conditions in advance.

P16612-033CF/-039CF/-043CF/-045CF, P16849-011CF/-012CF



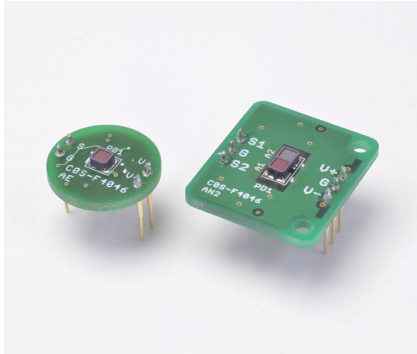
· After unpacking, store the device in an environment at a temperature range of 5 to 30 °C and a humidity of 60% or less, and perform reflow soldering within 1 year.

· The effect that the product receives during reflow soldering varies depending on the circuit board and reflow oven that are used. When you set reflow soldering conditions, check that problems do not occur in the product by testing out the conditions in advance.

KSPD80418EA

Related products

Evaluation kits M16607 series for InAsSb photovoltaic detector



The M16007 series are evaluation kits with an amplifier incorporating Hamamatsu's InAsSb photovoltaic detector (ceramic package with band-pass filter). These can detect infrared light transmitted through a band-pass filter simply by connecting a power supply (± 15 V). Two-element type that can detect two wavelengths is also available.

Specifications

- **Gain: 30 V/V**
- **Frequency characteristics: DC to 80 kHz**
- **Recommended drive voltage: ± 15 V**
- **Built-in sensor: InAsSb photovoltaic detector
(ceramic package with band-pass filter)**

Type no.	Built-in sensor	Center wavelength (μm)
M16607-033CF	P16612-033CF	3.3
M16607-039CF	P16612-039CF	3.9
M16607-043CF	P16612-043CF	4.26
M16607-015CF	P16849-011CF	3.3, 3.9
M16607-016CF	P16849-012CF	4.26, 3.9

Evaluation kit M16615 for mid infrared LED



Note: LED sold separately

The M16615 is a driver for mid infrared LED (TO-46 package). The LED can be pulse-driven simply by connecting a power supply (+15 V). This is used in combination with the evaluation kit M16607 series for InAsSb photovoltaic detector.

Specifications

- **Applicable LED: Mid infrared LED (TO-46 package)**
- **Output current: 400 mA**
- **Output pulse: 10 μs**
- **Output cycle: 1000 μs**
- **Recommended drive voltage: +15 V**

Related information

www.hamamatsu.com/sp/ssd/doc_en.html

■ Precautions

- Disclaimer
- Safety consideration
- Surface mount type products
- Compound opto-semiconductors (photosensors, light emitters)

■ Technical note

- Compound semiconductor photosensors

Information described in this material is current as of July 2023.

Product specifications are subject to change without prior notice due to improvements or other reasons. This document has been carefully prepared and the information contained is believed to be accurate. In rare cases, however, there may be inaccuracies such as text errors. Before using these products, always contact us for the delivery specification sheet to check the latest specifications.

The product warranty is valid for one year after delivery and is limited to product repair or replacement for defects discovered and reported to us within that one year period. However, even if within the warranty period we accept absolutely no liability for any loss caused by natural disasters or improper product use. Copying or reprinting the contents described in this material in whole or in part is prohibited without our prior permission.

HAMAMATSU

www.hamamatsu.com

HAMAMATSU PHOTONICS K.K., Solid State Division

1126-1 Ichino-cho, Higashi-ku, Hamamatsu City, 435-8558 Japan, Telephone: (81)53-434-3311, Fax: (81)53-434-5184

U.S.A.: HAMAMATSU CORPORATION: 360 Foothill Road, Bridgewater, NJ 08807, U.S.A., Telephone: (1)908-231-0960, Fax: (1)908-231-1218

Germany: HAMAMATSU PHOTONICS DEUTSCHLAND GMBH: Arzbergerstr. 10, 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.: 13F-1, No.101, Section 2, Gongdao 5th Road, East Dist., Hsinchu City, 300046, Taiwan(R.O.C) Telephone: (886)3-659-0080, Fax: (886)3-659-0081 E-mail: info@hamamatsu.com.tw